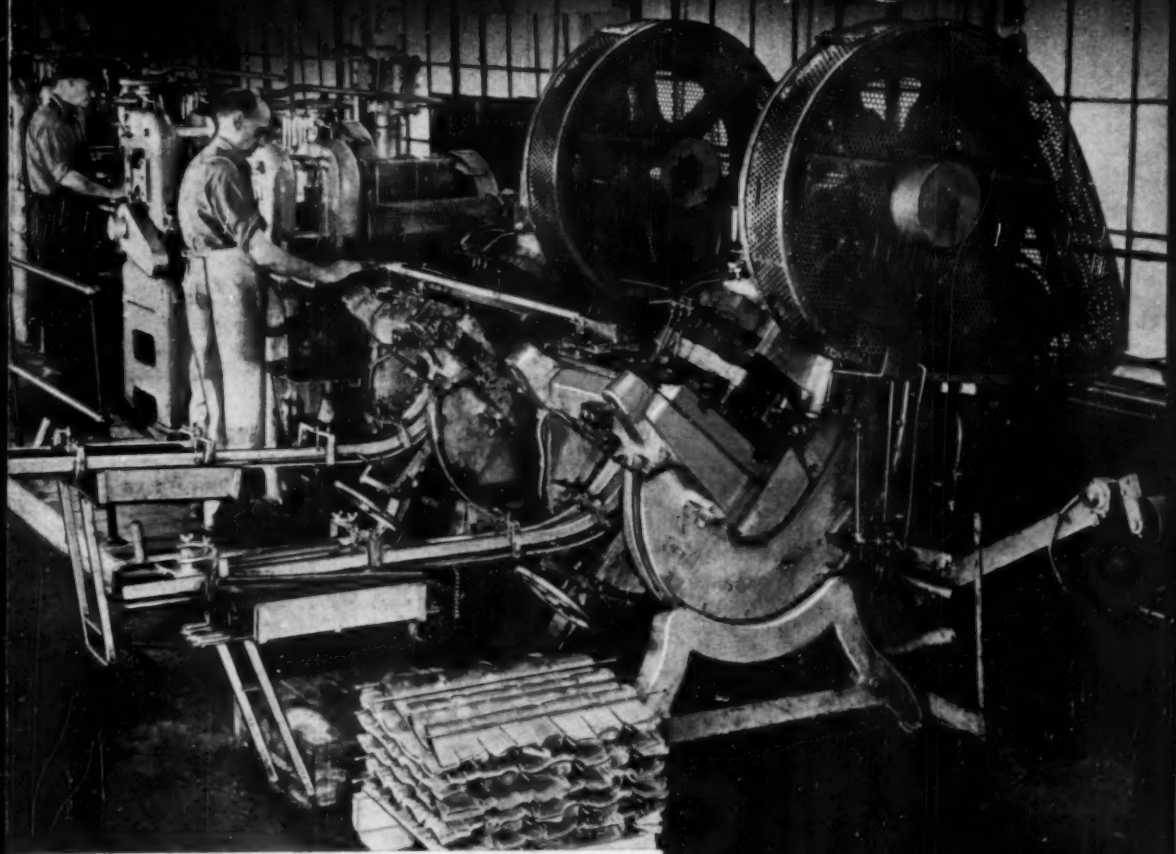
VOLUME 37
NUMBER 7

JULY, 1950

# plating



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**CREATING MODERN SILVERWARE**

See Contents Page 729

NEW CLEANING PROCESS for STEEL
prior to Bright Nickel and Chrome Plating
On Same Rack
Look into our new 1950
Clepo Compound Catalog
on page 11 for full details
A Request on your Company Letterhead
will bring one to you immediately.
CLEPO COMPOUNDS
FOR THE
ELECTROPLATING INDUSTRY
INCLUDING THE
CLEPO MOL-EX PROCESS
CLEANING CYCLES
This Issue Contains Supplement
on Plating Solution Analysis
FREDERICK GUMM Chemical Company Inc.
538 FOREST STREET KEARNY, N.J.
CLEANING COMPOUNDS
FREDERICK GUMM Chemical Company Inc.
538 FOREST STREET, KEARNY, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 541.

# He[illegible]ations

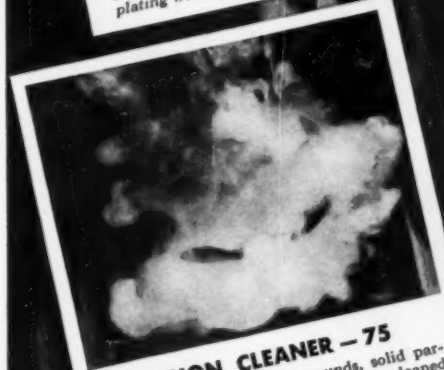
[illegible]AL FINISHING . . .

**METAL STRIPPER — A**

An outstanding development for stripping defective electroplated nickel, copper, silver, cadmium and zinc from steel. Fast action . . . no basis metal attack. The highly polished grill cover illustrated has been completely stripped of nickelplate, and is *ready for replating without repolishing.*

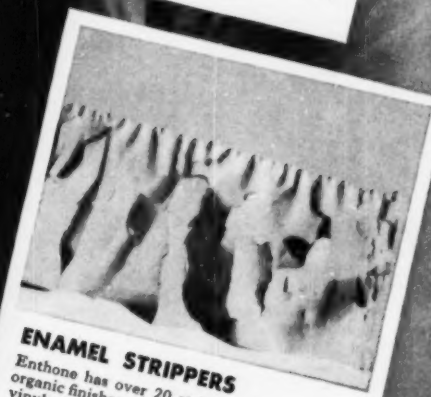
**EBONOL BLACKENING PROCESSES**

Ebonol finishes are used to beautify a widely diversified list of superior quality products. Photo shows steel parts blackened with Ebonol-S and S-30; copper and brass with Ebonol-C; zinc with Ebonol-Z. U. S. Patents — 2,364,993, 2,460,896, 2,460,898.



**EMULSION CLEANER — 75**

Oils, greases, buffing compounds, solid particles, deep seated in steel parts are cleaned out and completely removed by this emulsification process. Stubborn, gummy substances on die castings, milling machines, floors, motor blocks emulsify and disperse in water instantly.

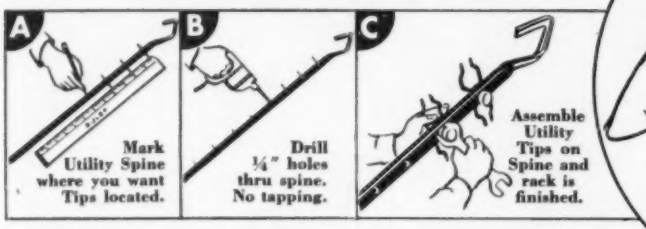


**ENAMEL STRIPPERS**

Enthone has over 20 strippers for removing organic finishes — synthetic enamels, lacquers, vinyls, japans. The best strippers, tailor-made for your particular problem, are selected by laboratory technicians after test runs. This service is rendered free of charge.

Enthone Incorporated

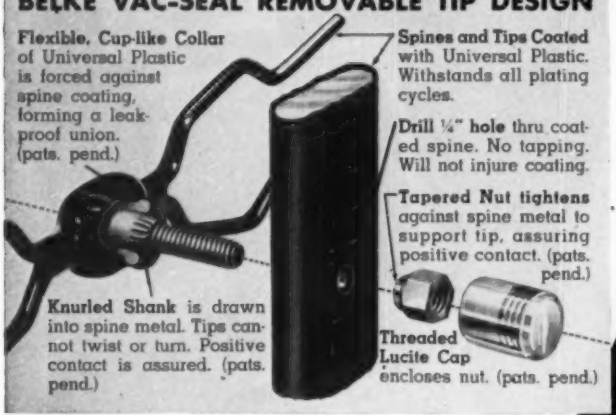
# Efficient Racks For Any Job In A Matter of Minutes


A
Mark Utility Spine where you want Tips located.
B
Drill ¼" holes thru spine. No tapping.
C
Assemble Utility Tips on Spine and rack is finished.

With a supply of *BELKE Utility Spines and Tips* on hand, it's that simple—that fast—that easy to have *complete racks* designed for your job, whether chrome or any other plating.

*Universal Plastic Coating on Utility Spines and Tips* withstands all cleaning and plating cycles. You space Utility Tips the way you want them. They join the spine with a leakproof seal, yet are easily changed or respaced on the spine. The five Utility Tip models have been developed in collaboration with experienced platers to efficiently handle 90% of all plating jobs. All models have spring pressure contacts for copper-nickel-chrome plating.

## BELKE VAC-SEAL REMOVABLE TIP DESIGN


Flexible, Cup-like Collar of Universal Plastic is forced against spine coating, forming a leak-proof union. (pats. pend.)
Spines and Tips Coated with Universal Plastic. Withstands all plating cycles.
Drill ¼" hole thru coated spine. No tapping. Will not injure coating.
Tapered Nut tightens against spine metal to support tip, assuring positive contact. (pats. pend.)
Knurled Shank is drawn into spine metal. Tips cannot twist or turn. Positive contact is assured. (pats. pend.)
Threaded Lucite Cap encloses nut. (pats. pend.)

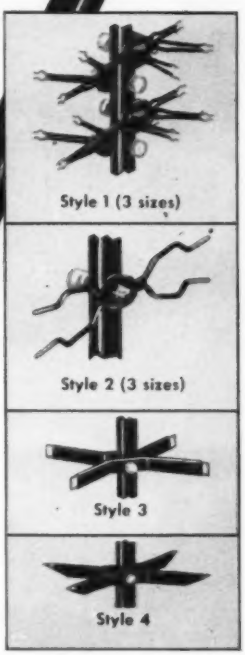
## BELKE UTILITY SPINES

**$2.85 ea.**

30" and 36" lengths. Fabricated from ¼" x ⅝" round-edge copper stock with thick coating of BELKE Universal Plastic.

## FIVE UTILITY TIP STYLES

Only 4 most popular shown. Other styles to specifications. All styles coated with Universal Plastic.




### *Plating Rack Economy Never Before Equalled*

BELKE Utility Racks give tremendous service life. The Removable, Interchangeable Tips enable you to use them over and over again on countless jobs of every description. When holes in Utility Spines are not in use, BELKE Removable Plugs can be used to seal out solutions.

What's more, BELKE Utility Racks cost you half as much as specially designed racks.

Immediate Delivery. Write for complete prices and specifications — or consult your BELKE Service Engineer.

**Belke MANUFACTURING CO.**
947 North Cicero Ave.
Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

# PROMAT

## Pro-Seal® finish

A superior, bright protective finish for zinc where the maximum in corrosion resistance and appearance is desired.

**PROMAT DIVISION, Poor & Company**
851 South Market Street, Waukegan, Illinois

Like "Sterling" on Silver

# We're helping with the dishes

That's a Dishmaster the young lady is using. And with it she *sprays* her dishes clean. A button on the spray handle lets her alternate fresh, clean suds with clear, hot rinse water.

How do we help? Well, Gerity-Michigan Corporation of Adrian, Michigan, makes the Dishmaster. And Wyandotte Metal Cleaner No. 147 helps make it better.

You see, the Dishmaster is a chromium-plated zinc base die casting. And in Gerity-Michigan's automatic plating machine Wyandotte No. 147 cleans the castings before plating. A soak clean in No. 147 is followed by a reverse current electroclean in No. 147.

Does Wyandotte No. 147 do a good job? Well, Gerity-Michigan thinks so. And if you'll take a look at the Dishmaster you'll agree. ($39.50—advt.)

If you want to know more about Wyandotte Metal Cleaner No. 147, write us today.

**WYANDOTTE CHEMICALS CORPORATION**
**WYANDOTTE, MICHIGAN**
SERVICE REPRESENTATIVES IN 88 CITIES

Wyandotte
REG. U. S. PAT. OFF.

# *Industry News*

**Plating Equipment and Supply House Opened in Southwest.** James E. Weaver has organized the Weaver Equipment & Supply Company at 610 Mayborn Drive, Temple, Texas, to provide "Complete Service to the Southwest Metal Finishing Industry". The company will represent, among others, Enthone, Inc., Roto-Finish Company, Williamsville Buff Division of Bullard Clark Company, Singleton Lucite Products Company, Lea Manufacturing Company, and Belke Manufacturing Company in Texas, Oklahoma, Arkansas, and Louisiana. Besides supplying equipment, processes, and chemicals, the new company is prepared to consult with metal finishers, lay out plating plants, do trouble shooting, and run analyses.

Mr. Weaver has over 15 years of experience with modern plating methods, including five years in the plating laboratory of National Cash Register Company, Dayton, Ohio, and four years as General Foreman and Process Engineer with Hickok Manufacturing Company, Rochester, N. Y. He helped inaugurate metal finishing training at Rochester Institute of Technology and taught electroplating in its night school.

**The Electric Products Company,** Cleveland, Ohio has appointed **The Klass Company,** Minneapolis, Minn., its representatives in the States of Minnesota, North and South Dakota, and the western counties of Wisconsin. It has also appointed the **Muth-Richards Company,** Seattle, Wash., to represent it in the State of Washington and in the panhandle of Idaho. These companies will handle all the industrial lines of Electric Products, including motor generators, motors, and frequency changers.

**Special Electroplating Training Plans Available to Industry.** The Joseph B. Kushner Electroplating School, licensed by the Pennsylvania Department of Public Instruction as a correspondence institution for training in modern electroplating practice, announces that there is now available to industrial organizations a special Electroplating Know-How tuition plan. This plan permits organization members to enroll at a 20 per cent reduction in the regular individual tuition fee, provided three or more members are enrolled at the same time. Also available to plating and metal finishing departments is a group-incentive plan in which the Company and the individual trainee share

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# CODMAN

FOR OVER

55 YEARS

THE GREATEST

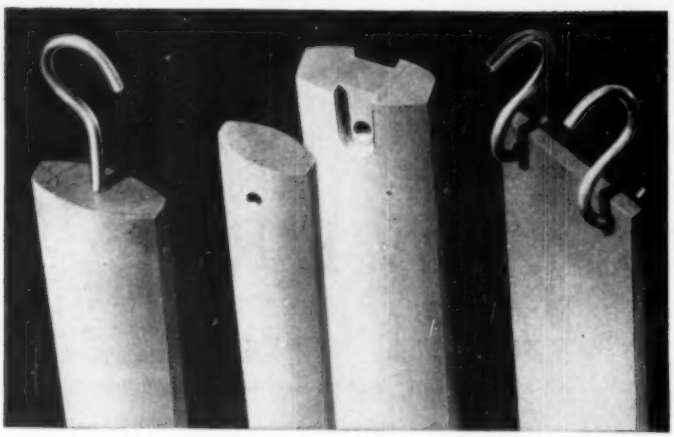
NAME IN BUFFS

F. L. & J. C. **CODMAN** COMPANY

ROCKLAND, MASSACHUSETTS

Branch Offices: DETROIT, LOS ANGELES, GRAND RAPIDS, PHILADELPHIA

# ANACONDA
## means purity in copper anodes



WHEN you specify ANACONDA, you are assured of unexcelled purity . . . less than 0.01 percent of total metallic impurities . . . an advantage that pays off five ways:

1. *Copper goes into solution faster and more uniformly.*
2. *The highest quality deposit is produced in the shortest possible time.*
3. *Slime is reduced to an absolute minimum.*
4. *Spotting and discoloration of the deposit are minimized.*
5. *Scrap losses are exceptionally low.*

In addition to copper, ANACONDA Anodes are furnished in brass and bronze . . . rolled sheet or oval . . . cut to your own specifications or standard sizes . . . drilled or undrilled . . . with or without hooks—also copper "cathode-anodes". For present or future reference, write for Publication C-5, The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

**for Plating with Copper, Brass or Bronze**

**Use ANACONDA Anodes**

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 547.


## *Industry News*

the cost of the tuition and the individual's share is refunded by the Company on the basis of course ratings. Those interested can write for further details to Joseph B. Kushner Electroplating School, Stroudsburg 230, Pa.

**Plating Supply and Equipment Warehouse in Dallas, Texas.** Davies Supply and Manufacturing Company of St. Louis, Mo., exclusive distributor for The Udylite Corporation in the Southwest, has opened a warehouse at 301 N. Market Street, Dallas, Texas. This is said to be the first complete warehouse for plating equipment and supplies in the Dallas area. The new operation will offer complete service and will stock every need for Dallas plating industries, including cleaners, solvents, buffs, polishing and buffing compounds, as well as plating machines and chemicals.

**Waste Disposal.** Representatives of 22 of the Nation's leading industries concerned with difficult waste-disposal problems affecting the quality of the country's water resources concluded a two-day conference with the Public Health Service on May 10.

The meeting resulted in the establishment of a National Technical Task Committee on Industrial Wastes, which then drew up the broad outlines of an Industry-Federal Government approach to the control of water pollution caused by industrial wastes and set itself three immediate tasks:

1. To assemble a source list of existing processes and practices employed in using, treating, and controlling industrial wastes

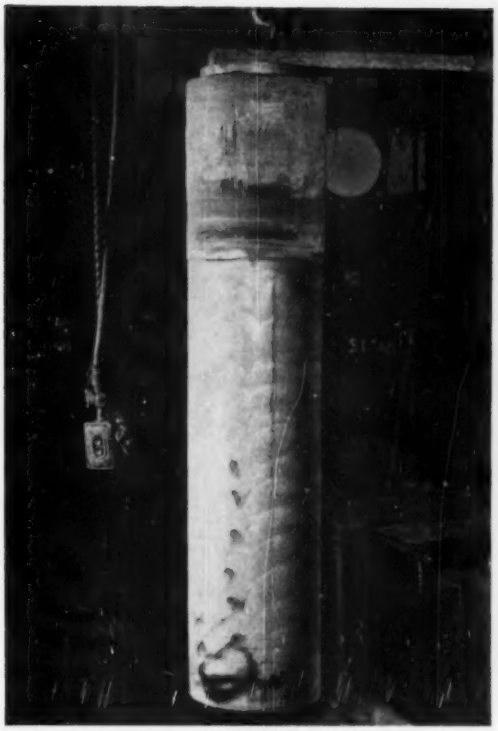
2. To assemble a tabulation of research projects concerned with utilization, treatment, and disposal of wastes—those underway and those contemplated

3. To provide a list which will define problems that confront a given industria- group and for which there is no satisfacl tory solution, particularly those which are common to more than one industry.

The Committee elected as chairman Lyman Cox, Waste Disposal Consultant, E. I. duPont de Nemours and Company, Inc., Wilmington, Del., and Chairman of the Water Pollution Abatement Committee, Manufacturing Chemists Association, Washington, D. C.

The task committee also established four major "task groups", of which Task Group III, Chemical Processing, will have a subcommittee on the Electroplating Industry.

The Committee voted to hold its next meeting in Cincinnati, in October, to acquaint itself with the activities of the Environmental Health Center. Carl E. Schwob, Chief, Division of Water Pollution Control, Public Health Service, ex-



*Anodes, tank linings and coils of Nalco Metal have increased resistance to corrosion in chromic acid solutions.*

# new lead alloy with built-in resistance to chromic acid nalco metal

Reg. U. S. Pat. Off.

NALCO METAL was developed by the research laboratories of National Lead for only one purpose . . .

. . . to give you a lead alloy specifically designed for long, trouble-free service in chromic acid solutions.

**Protective "armor" stays on**

NALCO METAL has built-in resistance to chromic acid. It retains the protective coating of lead chromate which forms on the metal when in contact with chromic acid.

With alloys previously used, the lead chromate coating would form, fail, and then re-form in unending cycles of disintegration.

Not so with NALCO METAL. Once established, its protective "armor" of lead chromate *stays* on.

**For hard or decorative plating**

NALCO METAL is intended for use in both hard and decorative plating as tank linings, coils, and anodes.

Sheets of NALCO METAL can be readily cut and shaped to line any tank; joints can be inseparably burned. In pipe form, NALCO METAL can be coiled or bent into units of any design. Anodes can be fashioned to suit any plating job.

For more information on NALCO METAL as it applies to your plant, get in touch with our nearest office.

**See for yourself**

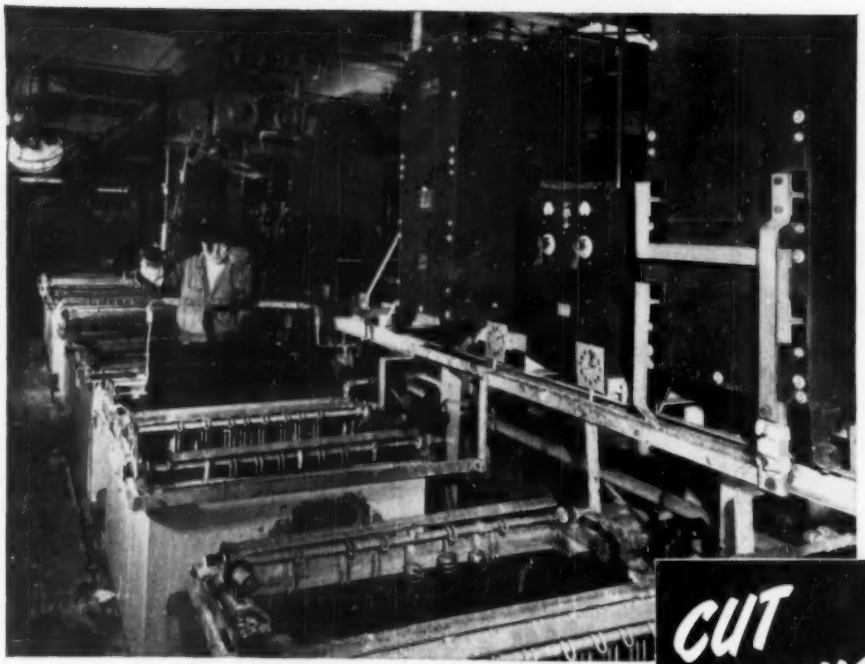
*After six months' immersion in standard chromic acid solution, the Nalco Metal test strip at right shows virtually no corrosion. Note corrosion of the 6% antimonial lead strip.*

**NATIONAL LEAD COMPANY**
*111 Broadway, New York 6, N. Y.*

*Offices and Plants in Principal Cities; Pacific Coast: Morris P. Kirk & Son, Inc., Los Angeles; Canada: The Canada Metal Company, Ltd., Toronto.*

Dutch Boy PRODUCTS

Trademarks
Reg. U. S. Pat. Off.



# THIS G-E PLATING RECTIFIER INSTALLATION

**CUT PRODUCTION TIME 66%**

The National Screw & Manufacturing Company of Cleveland, Ohio had outgrown their original facilities. Their old system was inflexible and inadequate. Voltage fluctuated as individual tanks came on and off. Uneven plating power was causing uneven plating. Rejections were high and the situation had become critical, especially in view of the company's policy of producing only the highest quality jobs.

To correct this situation the Company decided to completely modernize their plating department and purchased General Electric "Packaged-Power" units—with *copper-oxide rectifiers*.

After the new rectifier system had been installed, here is what they found:

- **Production time cut by an average of 66%**
- **Steady plating voltage—to every tank**
- **Predetermined plating time**
- **Better production scheduling and accurate cost accounting**
- **Better control of quality—rejections practically eliminated.**

All in all, the company has calculated that *the complete investment will pay for itself in less than two years* and then return a handsome annual profit.

**What would G-E "Packaged-Power" plating equipment do for you? Your local G-E Apparatus Department representative can show you.** ***Apparatus Dept., General Electric Company, Schenectady 5, N. Y.***

**GENERAL ELECTRIC**

464-3

# DON'T

## *Let Chromic Acid Fumes*

# SMOTHER YOUR PROFITS!

**For over three years, NO-CRO-MIST has been helping Chrome Plating in these important ways:**

**MAINTENANCE**

Solves the problem of maintenance of ventilating equipment; keeps chromic acid in the tank where it belongs instead of letting it destroy ventilating equipment, roofs, grass or automobile finishes. Re-racking between nickel and chrome can be avoided; busbars are kept cleaner.

**ECONOMY**

Can be used economically in any strength bath containing 25 to 54 oz./gal. chromic acid by improved system for addition. Saves chromic acid.

**BETTER OPERATION**

Improves covering power and extends the plating range of the bath. Solves many problems of plating around holes and recesses.

**SAFEGUARDS HEALTH**

NO-CRO-MIST is a soluble addition agent that eliminates up to 95% of chrome spray evolved in plating. This means that fumes are eliminated from the plating room (especially noticeable in summer) and health of workmen is safeguarded.

**FOR FREE ONE GALLON SAMPLE — PIN COUPON TO YOUR LETTERHEAD!**

ROHCO

ROHCO PRODUCTS
NO-CRO-MIST • HULL CELL TEST • ROHCO 20XL CADMIUM BRIGHTENER ROHCO 100 BARREL ZINC BRIGHTENER • RINSE-AID • CROMETER

**R. O. HULL & CO., INC.**
**1302 Parsons Court**
**Rocky River 16, Ohio**

*Canada:* Armalite Company, Ltd.
Toronto 6, Canada

*"YOUR PLATING IS BEST WITH THE HULL CELL TEST"*

FREE—JUST PIN THIS COUPON TO YOUR LETTERHEAD!

R. O. HULL & CO., INC.
1302 Parsons Court
Rocky River 16, Ohio

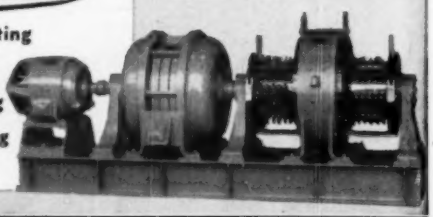
Gentlemen: PLEASE SEND A FREE SAMPLE (One Gallon) OF NO-CRO-MIST FOR MY EVALUATION.

Chrome Tank Size ..... Gal.
Operating Temperature ..... °F.
Chromic Acid Content .....

NAME .....
COMPANY .....
STREET ADDRESS .....
CITY & STATE .....

Motor Generators
by
COLUMBIA
For Electroplating
Anodizing
Electrocleaning
Electropolishing

There's a Columbia M-G Set available for your needs, whether you have a small plating bath or a large continuous strip plating line. Capacities up to 20,000 Amperes; 6 Volts and up. Dependable, performance proved, for many years. Your inquiries solicited.



COLUMBIA ELECTRIC MFG. CO.
4533 HAMILTON AVE. CLEVELAND 14, OHIO
Write for Catalog PL-700

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 551.



UNIFORM FINISH
FASTER PLATING
PROMPT DELIVERY

HUSSEY
Pure Copper
ANODES

Here are the basic tools for real craftsmanship in electroplating. Available in a full range of shapes and sizes, Hussey Pure Copper Anodes assure uniform finish and fast, dependable plating. For fastest service call the Hussey warehouse near you.

OUR 102nd YEAR

C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
ROLLING MILLS AND GENERAL OFFICES, PITTSBURGH 19, PA.
7 Convenient Warehouses to serve you promptly!

PITTSBURGH....2850 Second Avenue
CLEVELAND....5318 St. Clair Avenue
NEW YORK....140 Sixth Avenue
CINCINNATI....424 Commercial Square
CHICAGO....3900 N. Elston Avenue
ST. LOUIS....1620 Delmar Boulevard
PHILADELPHIA....1632 Fairmount Avenue

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 552.


## Industry News

plained that the Cincinnati Laboratory will serve as a valuable source of information and technical assistance to those industries confronted with unfamiliar waste disposal problems.

**New Electrolytic Tin Plate and Galvanizing Lines.** Carnegie-Illinois Steel Corporation has announced a program of improvements in its Gary, Ind., plants which will increase the tin-plate producing capacity of Gary Sheet and Tin Mill by 120,000 tons annually and raise this plant's annual tin-plate capacity to 732,000 tons. The program provides for installation by the end of 1950 of a fourth electrolytic tinning line to operate at 1,000 feet per minute and of a continuous annealing furnace.

A new, 600-foot-long galvanizing line, which makes it possible to heat-treat and galvanize continuously coils of cold-rolled steel sheets, was completed in April at the Gary mill. The line, capable of galvanizing coils of steel at a rate of 300 feet per minute, in widths up to 48 inches, has an annual production capacity of 60,000 tons.

**De Vilbiss Plant in California.** The De Vilbiss Company has opened a new assembly, warehousing and distributing plant in Santa Clara, Calif., for spray-painting equipment, air compressors, hose, spray-paint booths, atomizers and related items. The new plant will serve the territory covered by De Vilbiss sales branches in San Francisco, Los Angeles, and Salt Lake City.


EXPERIENCED ESTIMATOR

Wanted by old established, large job plating shop for taking in and pricing job work, particularly silver plating. Position is permanent and offers excellent opportunity to right person. Located in Mid-Atlantic Coast City.
*Reply to:*

P-750A, PLATING
P. O. Box 168, Jenkintown, Pa.

TERRITORY AVAILABLE

Opening for good representative now contacting Platers, Metal Finishers and Heat Treaters to add our line of products—Black Oxide Finishing materials, Cleaners, Oils, Heat Treating salts. Territory consisting of Eastern Pennsylvania, Southern New Jersey, Delaware and Maryland. Commission only. Write for details giving background and experience, etc.
*Reply to:*

P750-B, PLATING
P. O. Box 168, Jenkintown, Pa.

# *With these* 3 MICCRO COATINGS

**YOU CAN COAT ANY PLATING RACK GIVING POSITIVE INSULATION AND COMPLETE PROTECTION THROUGH ALL PLATING CYCLES**

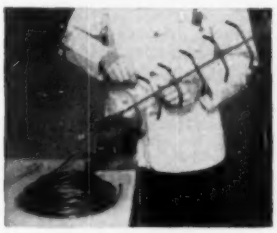
**Any plant using these three MICCRO products – MICCROTAPE, MICCROTUBE and MICCROTEX – is equipped to coat any and all types of plating racks. All three products possess the same basic dielectric strength and insulating qualities. They may be used separately or together – since they will fuse and blend to form a homogeneous leakproof coating. They may also be used to give increased life to RUBBER COATED RACKS. Throughout the plating industry these three MICCRO products have established highest records of performance and economy.**

## 1 MICCROTAPE

An extruded tape ¾ inch in width, .012" thick in center with tapered edge of .005" (an exclusive feature). Permits much smoother overlapping, closer fit in grooves and around shoulders. Quickly applied – no heat sealing necessary. Has high dielectric strength, remains tough and permanently elastic. Miccrotape may also be used to repair rubber coated racks.

## 2 MICCROTUBE

An extruded tubing with the same physical and insulating characteristics as Miccrotape. Speedily applied to straight and bent contact wires, also round splines. Will fuse with Miccrotape into a perfect leakproof coating. Available in inside diameters from $\frac{1}{16}$" to 1", in thin-wall or thick-wall tubing.



## 3 MICCROTEX

*Write for detailed bulletins of these three Miccro products.*

A superior thermoplastic air-dry insulating material that meets the requirements of all plating cycles and phosphate coatings. May be dipped, brushed or sprayed. Is tough, resilient and flexible – minimizes drag-out – attains maximum adhesion without shrinkage.

MICCRO Products

*Developed and Manufactured by*

**MICHIGAN CHROME and CHEMICAL COMPANY**

6351 EAST JEFFERSON AVENUE • • • DETROIT 7, MICHIGAN

# AVAILABLE FOR IMMEDIATE SHIPMENT ATTRACTIVE VALUES

**THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:**

1—15,000/7500 AMPERE 6/12 VOLT **COLUMBIA ELECTRIC CO.** with Separate M. G. Exciter.

1—10,000/5000 AMPERE, 6/12 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Synchronous Motor. Excellent Condition.

2—7500/3750 AMPERE, 8/16 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Synchronous Motor.

1—5000/2500 AMPERE, 6/12 VOLT **MUNNING** "OPTIMUS." Separately Excited.

1—3000/1500 AMPERE, 6/12 VOLT **CHANDEYSSON ELECTRIC CO.** Synchronous Motor. Exciter-in-Head.

1—3000/1500 AMPERE, 6/12 VOLT **ELECTRIC PRODUCTS CO.** Synchronous Motor. Separately Excited.

1—2000/1000 AMPERE, 12/24 VOLT **HANSON-VAN WINKLE-MUNNING.** Separately Excited.

1—1500/750 AMPERE, 6/12 VOLT **HANSON-VAN WINKLE-MUNNING.** Shunt Wound. Separately Excited.

3—1250 AMPERE, 15 VOLT **COLUMBIA ELECTRIC CO.** Exciter-in-Head.

2—1000/500 AMPERE, 6/12 VOLT **CHARLES J. BOGUE ELECTRIC CO.** Separately Excited. Interpole Design. Exciter-in-Head.

1—750 AMPERE, 12 VOLT **CHANDEYSSON ELECTRIC CO.** Synchronous Motor. Exciter-in-Head.

1—1500 AMPERE, 40 VOLT **HANSON-VAN WINKLE-MUNNING** Anodizing Synchronous MG Set. Automatic Controls. Exciter-in-Head.

1—1000 AMPERE, 40 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Anodizing Synchronous MG Set. Exciter-in-Head.

1—1000 AMPERE, 25 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Anodizing Unit.

OTHER SIZES OF ELECTROPLATING AND ANODIZING MOTOR GENERATOR SETS IN STOCK.

4—**G. E.** COPPER OXIDE RECTIFIER, 500 AMPERE, 6 VOLTS, for operation on 220/3/60.

3—**HANSON-VAN WINKLE-MUNNING** COPPER OXIDE RECTIFIERS, 500 AMPERES, 6 VOLTS, with 220/440 volt, 3 phase, 60 cycle input. **SPECIAL . . .**

3—**DIVINE BROS.** BUFFING LATHES, **NEW,** 7½ HP, 220/3/60/2800 RPM. PRICED RIGHT.

**M. E. BAKER CO.**

25 WHEELER STREET
CAMBRIDGE, MASS.


# *Personals*

**Robert H. Heppel** has been appointed to head the sales and service departments in Dallas, Texas, of Davies Supply and Manufacturing Company, exclusive distributors in the Southwest for the Udylite Corporation.

Heppel

Holder of a B.S. degree from Carnegie Institute of Technology, Mr. Heppel was with the Detrex Corporation, Detroit, Mich., for ten years and with Dravo Corporation, Pittsburgh, Pa., for four years prior to joining Davies.

**Dr. Chester A. Snell** represented Foster D. Snell, Inc., at the First United States Technical Conference on Air Pollution held at the Wardman Park Hotel, Washington, D. C., May 3–5, under the sponsorship of the Federal Interdepartmental Committee. As Director of the Analytical Department of the firm, Dr. Snell has had occasion to conduct a number of extensive surveys of air contamination to determine whether or not proper precautions are being taken by various plants. His findings have led to recommendations which have reduced or eliminated air pollution. He has presented a number of papers on the subject in recent months.

**J. D. "Don" Johnson,** of Detroit, has been appointed to the sales organization of Frederic B. Stevens, Inc. With headquarters at the Detroit Office, he will cover part of the western and northern Michigan territory.

Mr. Johnson is a graduate of the University of Detroit, where he received the degree of Bachelor of Mechanical Engineering. He has a well founded background of sales and research work, having spent about two years in the latter field with the Research and Development Division of the U. S Army at the Detroit Arsenal.

**L. J. Amsdell** has been appointed Director of the Pipe Joint Division of Gates Engineering Company, New Castle, Del. He was formerly with Goodyear for eighteen years in a sales-management capacity. He was born in Valparaiso, Ind., and attended Valparaiso University.

Amsdell's duties will include sales direction of the GACO Pipe Joint System in conjunction with rubber-lined pipe.

*David B. Stockton (left) and Lawrence Stockwell (right) whose million dollar sales records with the Udylite Corporation were mentioned in the May issue*

**Charles Miller,** General Manager and co-owner of The Filter Paper Company, 2433 S. Michigan Avenue, Chicago 16, Ill., has become sole owner, having purchased the full interest of his partner in February of this year. The company handles equipment and materials for the metal finishing industry including plate-and-frame filter presses, water filters, stainless-steel storage and mixing tanks, portable agitators, pumps, filter paper, filter cloths and bags, and many other products.

**Dr. James T. Eaton** has been named Director of Research of the E. F. Houghton Company, oil and chemical manufacturers, Philadelphia, Pa. Dr. Eaton, who was formerly Manager of Research, is in full charge of the company's Research and Control Department.

**Merton B. Lilly** has been appointed head of the Patent Department of Wyandotte Chemicals Corporation. He holds degrees in both chemistry and law and comes to Wyandotte Chemicals from the patent law firm of Owen and Owen, Toledo, Ohio. After his graduation in law from the University of Maryland in 1940, Mr. Lilly was with Western Electric Company, working first with patent searches and patent applications and then as a chemical development engineer. In 1944, he joined Battelle Memorial Institute, Columbus, Ohio, as head of the newly organized patent department. In 1949, he joined Owen and Owen. He succeeds **William R. Day** at Wyandotte Chemicals, who was recently promoted to Assistant to the President.

Lilly

# "Buffing Compound Removal was ~~is~~ a Tough Job!!!"

● That's the title of the booklet describing in detail Cowles SO Cleaner—the remarkable new buffing compound remover *which really works.*

SO will effectively loosen the most stubborn, heavy, impacted, ground-in buffing compounds for subsequent removal in the electrolytic tanks. The latest developments in metal cleaning research have been incorporated in this new product. Its superior penetrating and wetting action quickly loosens dirt and impacted buffing compounds from *any metal.* SO can be used in still tank, fully and semi-automatic machines and is compatible with a wide range of temperatures. Because SO produces stable emulsions at low concentrations, it assures thorough rinsing.

**COWLES CHEMICAL COMPANY**
**METAL CLEANER DEPARTMENT**
**7016 Euclid Avenue • Cleveland 3, Ohio**

***The Booklet*** gives you complete information—send for it today. The coupon is for your convenience.

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7016 Euclid Avenue
Cleveland 3, Ohio

Please send me your folder "Buffing Compound Removal ~~is~~ was a Tough Job!!!"

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

## *Personals*

**David Busker,** previously associated with Hilo Varnish Corporation, Roxalin Flexible Finishes and the National Bureau of Standards, has joined Better Finishes

**Busker**

and Coatings, Inc., Newark, N. J. A graduate of the College of the City of New York, University of Maryland, and the Newark College of Engineering, Mr. Busker is well known for his contributions to the "Plastic Encyclopedia" and leading technical publications in the chemical and coatings field. In his new connection he will be in charge of the development of special-purpose industrial finishes and maintenance paints.

**George D. Stevenson** has joined the sales organization of Frederic B. Stevens, Inc., and will cover the Cleveland and adjacent Ohio territory. He has an unusually diversified background. Having done production work with Bethlehem Steel Corporation and Buffalo Electro-Refractories Corporation, he was for five years with the Food Products Division of Beechnut Packing Company as sales representative, promotion trainer and supervisor, then spent some time with Fisher Body Corporation and Addressograph-Multigraph Corporation on methods and time study. For the past six years he was associated with the Grand Industries, Inc. as industrial engineer.

**Paul C. Hurley, Jr.,** is now manager of Pennsylvania Salt Manufacturing Company's newly created Sales Promotion Department and will be in charge of advertising, promotion research, and salesmen training.

Coming to Pennsalt in 1943 as a salesman in the Laundry and Dry Cleaning Department, Mr. Hurley held positions in that division as District Sales Manager and Merchandising Manager before becoming attached to the staff of William P. Drake, Vice-President in Charge of Sales, about a year ago. During the war he served as a Civilian Instructor for the U. S. Army Air Corps at the Advanced School of Specialized Mechanical Training operated by TWA.

**Philip H. Beach** has been appointed General Sales Manager of Egyptian Lacquer Manufacturing Company, with headquarters in South Kearny, N. J. Mr. Beach has been with Egyptian since 1931, serving first as a sales representative in Massachusetts and Rhode Island, then as an Assistant Sales Manager. His last position before his promotion was that of Regional Sales Manager for New England. **John B. de Brun** has been transferred from Egyptian's New York offices to assist Mr. Beach as Assistant Sales Manager, and **Jack Malool** has become Regional Sales Manager for the Metropolitan New York area.

**Harold J. La Casse** has joined Pennsylvania Salt Manufacturing Company's Special Chemicals Department as field sales-service representative in the Indiana territory. He takes over the territory relinquished by **John C. Hampson,** when he recently became Sales Manager of the departmentment's newly formed Chicago district.

Mr. La Casse comes to Pennsalt from the Stewart-Warner Corporation of Chicago, where he was a material-specifications engineer. Previously he was associated with General Electric and Eastman Kodak in electroplating and metal-finishing operations. He was graduated from the University of Rochester as an industrial engineer. He is at present living in Indianapolis.

**Donald D. Clark** has joined the research staff of United Chromium, Incorporated, Detroit, Mich., to do electroplating re-

**Clark**

search. He hails from Michigan State College, where he acted as assistant to Dr. D. T. Ewing on the American Electroplaters' Society Project No. 5, "The Effects of Metal Impurities on the Physical Properties of Electrodeposited Nickel".

### Obituaries

✠ **Arthur E. Gibbs,** formerly Research Director of Pennsylvania Salt Manufacturing Company, Philadelphia, Pa., died on March 2 in Summerville, S. C., while on a hunting trip. He was seventy-four.

Mr. Gibbs was born in Bath, England, and graduated from Bristol University. Shortly after coming to this country he joined the Pennsylvania Salt Manufacturing Company at its plant in Wyandotte, Mich., where he invented and developed the Gibbs cell for the electrolytic production of chlorine, caustic soda and hydrogen, from common salt brine.

In 1908 he organized the first separate Research and Development Department of Pennsalt at the Wyandotte plant, and this was moved later to Philadelphia under his direction in 1912. He was later named Advisory Technical Director and served in this post until his retirement in 1945.

He was a member of The Electrochemical Society and Faraday Society, England.

✠**Dr. Herbert M. Kaufmann,** Chairman of the Board of Directors of Mutual Chemical Company of America, died on March 20 at his home in New York City after a short illness.

Born in Philadelphia in 1870, he graduated as a chemist at the age of eighteen from the University of Pennsylvania, then continued his studies at the Zurich Polytechnic Institute and obtained his doctorate in chemistry in 1891 from the University of Basle. In 1896, he joined the Mutual Chemical Company of Jersey City as chemist, superintendent, and works manager. In 1908, that company, which was then a major factor in the chromium chemical industry, and the American Chrome Company were merged to form the present Mutual Chemical Company of America. Dr. Kaufmann was its President from 1933 to 1943 and Chairman of its Board of Directors since then.

✠**Charles H. Awkerman,** Chairman of the Board of Directors of The Udylite Corporation, Detroit, Mich., passed away on May 7.

✠**Eugene C. Sumereau** died on April 13, seventy years of age. He was the head of Eugene C. Sumereau & Sons of New York City, a concern founded in 1854 by members of the same family. Widely and favorably known to the electroplating and metal products manufacturing industries of New York, he had retired about ten years ago, leaving the operations in charge of his sons, George and Victor, who will carry on the business as before without change in policies. Mr. Sumereau also left a widow, Mrs. Eugene C. Sumereau, and two daughters, Mae and Eugenie.

✠**Daniel Wittig** died on April 30. Having joined the Milwaukee Branch of the American Electroplaters' Society on August 13, 1913, he gave the Branch and the Society his utmost in support. Although never well to do, he gave freely of his means to the Branch and to the Society's Research Committee when they were in need. On June 1, 1936, he was elected to honorary membership of both the Branch and the parent body.

Active in the A. E. S. until prevented by illness a year ago, he will be sadly missed by his friends and fellow members.

# Federated ANODES

## for the Plating Trade

**COPPER** Anodes . . . M-Sterling Chill-formed in flat, oval, wedge, and ball shapes. Open mold shapes also available. All of prime electrolytic copper.

**COPPER** Anodes . . . electro-deposited, in all standard sizes . . . special sizes to order.

**LEAD** Anodes . . . the M-Sterling Dated Conducta-Core Anode with specially designed strong hooks coated to protect against acid fumes and spray.

**TIN** Anodes . . . flat and oval shapes . . . all standard sizes . . . made only of extra high purity tin.

**ZINC** Anodes . . . only of Special High Grade zinc in all standard sizes and shapes.

**BRASS** Anodes . . . full range of analyses . . . flat, oval, wedge, and ball shapes.

*Federated Anodes are sold through offices in 22 principal cities. Quality is continuously controlled by Federated metallurgists so that the anodes are free of gates, flash, and cavities . . . of high chemical purity . . . to give uniform plating performance.*

Federated first in the non ferrous field FMD

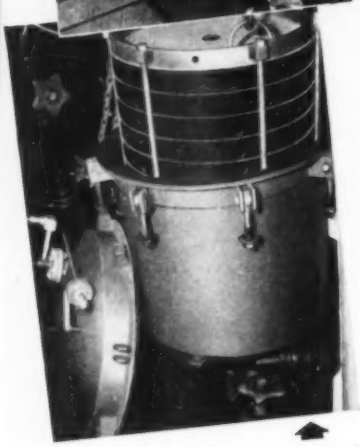
*Write, wire, or phone for complete information*

## Federated Metals Division

American Smelting and Refining Company, 120 Broadway, New York 5, New York

# No repairs or maintenance in over 17,000 hours of 'round-the-clock operation

## . . . yet this SPARKLER Horizontal Plate FILTER is still going strong



The kind of service Sparkler Horizontal Plate Filters have given the Gillette Safety Razor Company—efficient and trouble-free, even under most extreme conditions—is the kind of service that is vital to *every* filtering operation.

For example: A rubber-lined Sparkler Model 8-18 filter is used by Gillette in the continuous filtration of a 1000-gallon bright nickel plating solution. Now operating for approximately two years, this filter has been on a 24 hours a day, 7 days a week schedule — without any loss of operating time for repairs or maintenance. Also used in periodic batch carbon treatments of nickel solutions this unit, according to Gillette technicians, consistently delivers a brilliantly clear effluent, even though the plates may be packed solid.

Another Sparkler Filter employed by Gillette is a Model 8-6, stainless steel, portable unit. Used exclusively for cyanide type plating solutions, this Model 8-6 has proved particularly valuable for Gillette's gold plating operations since the patented Sparkler Scavenger Plate assures minimum loss of precious gold solution. Now operating almost six months for at least 2 hours daily, its performance has been satisfactory in every respect.

Top: Sparkler Model 8-18 filter shown installed in Gillette's plating department. Above: Same filter, with filter plate assembly being removed for cleaning

Left: Sparkler Model 8-6 stainless steel filter. This portable unit is used by Gillette to filter gold plating solutions.

*Our Engineering Department (with more than 25 years' experience in every phase of filtration) is available for consultation without charge.*

**SPARKLER MANUFACTURING CO.**
MUNDELEIN, ILLINOIS




FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 559.

## *Trade Literature*

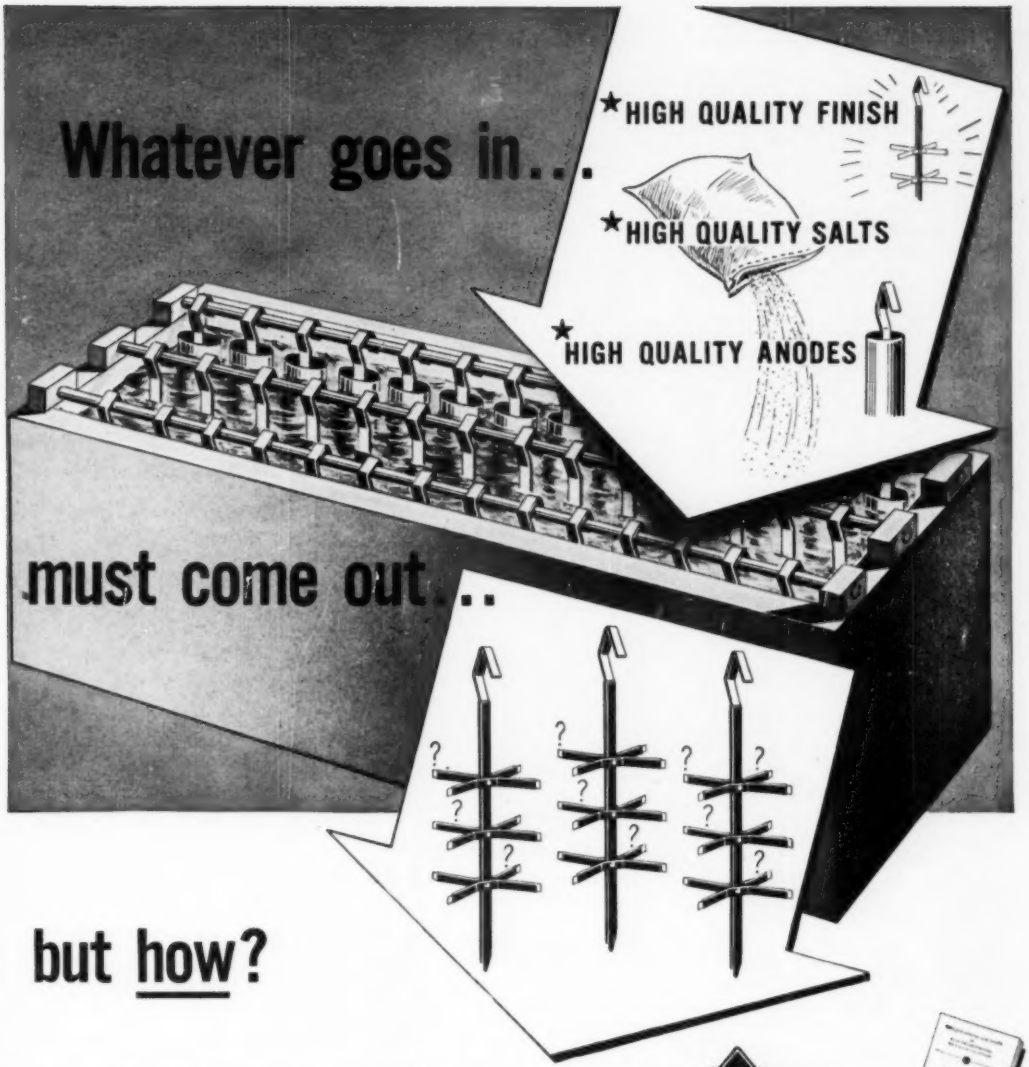
**L—442. Heavy-Duty Cleaning Compound**—A heavy-duty, alkaline cleaning compound, that has been developed for the cleaning of steel prior to vitreous enameling, is described in a folder, Detrex 70, that has just been released by Detrex Corporation, Box 501, Detroit 32, Mich. For your copy, use Reader Service Card.

**L—443. Wet Abrasive Blaster**—The Cro-Plate Company, 3343 Main Street, Hartford 5, Conn., offers a 4-page illustrated bulletin describing its Cro-Hone equipment and its important applications in die and mold polishing; stain and scale removal; deburring; surface blending; surface preparation before electroplating, painting, or lacquering, etc. Among special features are moderate cost, absence of moving parts, stainless-steel construction, compactness, water-tight doors, adaptability to through conveyor systems. For your copy, use Reader Service Card.

**L—444. Vapor Degreasing**—Optimus Equipment Company, Matawan, N. J., offers a 28-page well-illustrated "Vapor Degreaser Manual". Following a description of the process and its advantages, the manual shows a variety of degreaser designs and gives instructions for installation, operation, and maintenance of the units. Concluding sections deal with solvent-recovery stills, solvents, and Optimus services. For your copy, use Reader Service Card.

**L—445. Surface Active Agents**—A new 8-page folder F-5900 entitled "'Tergitol' Surface-Active Agents" is now available to manufacturers in the wet-processing industries from Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. Properties, uses, and specifications of "Tergitol" wetting agents 7 and P-28 and of "Tergitol" penetrants 4, 08, and EH are given. Data on average wetting times in solutions of the different products in various acid, base, and salt solutions are presented, along with information on the effects of organic solvents on wetting time. A useful table for the selection of the most efficient "Tergitol" surface-active agent for any given application is featured. For your copy, use Reader Service Card.

**L—446. Tumbling Barrels**—Lupomatic Industries, Inc., 4510 Bullard Avenue, New York 66, N. Y., has issued two illustrated bulletins that give complete specifications on two types of Tumb-L-Matic tumbling barrels.




Only through the use of good operating technique and by adhering to approved specifications can the high quality of the raw materials be converted into the ultimate finish.

Vendors of plating supplies conscientiously maintain the high quality of their anodes, salts, chemicals, etc. Polishing methods are constantly being improved to prepare the basis metal for the deposit.

But . . . . it is only the plater himself who can insure that parts coming from the plating tank have a high quality, serviceable finish.

Send for your free copy of A.S.T.M.-A.E.S. SPECIFICATIONS AND TESTS FOR ELECTRODEPOSITED METALLIC COATINGS.

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The International Nickel Company, Inc.
Dept. P, 67 Wall St., New York 5, N. Y.

Send me booklet entitled: "Specifications and Tests for Electrodeposited Metallic Coatings."

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*Company* _____

*Address* _____

*City* _____ *State* _____

**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET NEW YORK 5, N.Y.

## *Trade Literature*

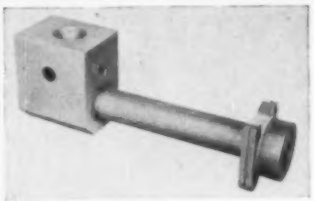
Bulletin No. XL-50 describes the type XL wet-process tumbling barrel, which can be used for deburring and cutting down of forgings, stampings, castings, and for wet ashing of plastics. Featuring heavy self-aligning bearings, sturdy framework, and a dependable chain drive from a heavy-duty motor, it is made in six standard sizes with single tumblers or in multiple units containing up to as many as six tumblers, either entirely enclosed or with open frame. It can also be adapted for wet ball burnishing.

Bulletin No. Mu-50 covers types F and S multiple-unit tumbling barrels for wet or dry processing. Both are used for heavy production deburring and for cutting down and finishing of wood, plastic and metal parts. Model "F" is a horizontal multiple unit, available with open or fully enclosed frame. Model "S" is a vertical multiple unit with open frame construction. For your copies, use Reader Service Card.

**L—447. Positive Displacement Metering Pump**—Milton Roy Company, 1300 E. Mermaid Lane, Chestnut Hill, Philadelphia 18, Pa., offers a 16-page Bulletin No. 450 describing its "aiRoymetric" or "aiRoy" pumps. These air-powered pumps are said to have a number of advantages, cost wise and in respect to flexibility. For example: one can set a simple automatic control to make the pump deliver, say, 30 shots in one minute and then follow with one shot every 30 minutes. These pumps also make it possible to sample industrial wastes in any desired volume over any fixed period of time.

Liquid ends are of standard Milton Roy double-ball check design in materials of construction to meet practically all corrosion problems and to handle viscous materials, solids or fibres in suspension, slurries or sludges, or other difficult-to-pump materials. For your copy, use Reader Service Card.

**L—448. Circulating Steam Jets**—National Carbon Division, Union Carbide and Carbon Corporation, 30 E. 42nd Street, New York 17, N. Y., offers a catalogue Section M-9101 which describes the Series FM-1A "Karbate" Brand impervious-graphite circulating Steam Jet



and gives design, installation, and operation details. Available in two sizes, size 2 and 4, with riser assemblies up to 9 feet 3¾ inches in height, it supplements the two types of "Karbate" impervious-graphite heat exchangers which are used for indirect heating of open tanks.

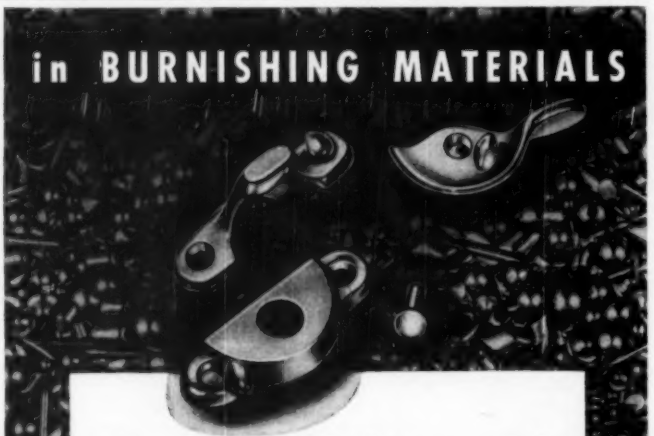
These circulating steam jets are particularly adapted to the heating of liquid in tanks where agitation, good circulation, and low cost are requisites and where dilution of the solution is not harmful. They withstand the action of practically all corrosive liquids. For your copy, use Reader Service Card.

**L—449. More Than 1000 Kinds of Atoms Charted**—Information on more than a thousand kinds of atoms is given on a new "Chart of the Nuclides" being distributed free to scientists in industrial laboratories, colleges, and universities by Dept. 6-221, General Electric Company, Schenectady 5, N. Y. Printed in checkerboard fashion on heavy paper, 26 x 50 inches, each of the 96 chemical elements which were known at the beginning of the year is given a horizontal line, in which a square is devoted to information about each isotope of that element. The chart is accompanied by an explanatory booklet. For your copy, use Reader Service Card.

**L—450. Cyanide Waste Disposal**—Fischer and Porter Company, Hatboro, Pa., offers a 4-page illustrated Bulletin No. A-1A-4, "Chlorine Treatment of Municipal Water", which should be of interest to those contemplating cyanide-waste treatment by chlorine gas, the two processes being fundamentally similar. For your copy, use Reader Service Card.

**L—451. Platers Cleaner**—An electrolytic cleaner compounded especially for use on steel, brass, nickel, and diecastings is described and illustrated in a folder, Detrex 53, being distributed by Detrex Corporation, Box 501, Detroit 32, Mich. For your copy, use Reader Service Card.


in BURNISHING MATERIALS



*it's the SHAPE that counts!*

*Smooth burnishing of rounded corners, undulating curves, deep depressions and rounded projections is the special job of Abbott Ovalballs. They're shaped to do the job right!*

Abbott Burnishing Materials, available in five shapes . . . Ball, Ovalball, Cone, Diagonal, Pin . . . are scientifically designed to make effective contact on metal stampings or castings of any size and shape. Each piece is a burnishing tool made from Abbott high quality bearing ball steel. Each is deep hardened and polished to a mirrorlike, glass-hard finish. For the best burnishing results . . . use Abbott!

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the all rounded ball

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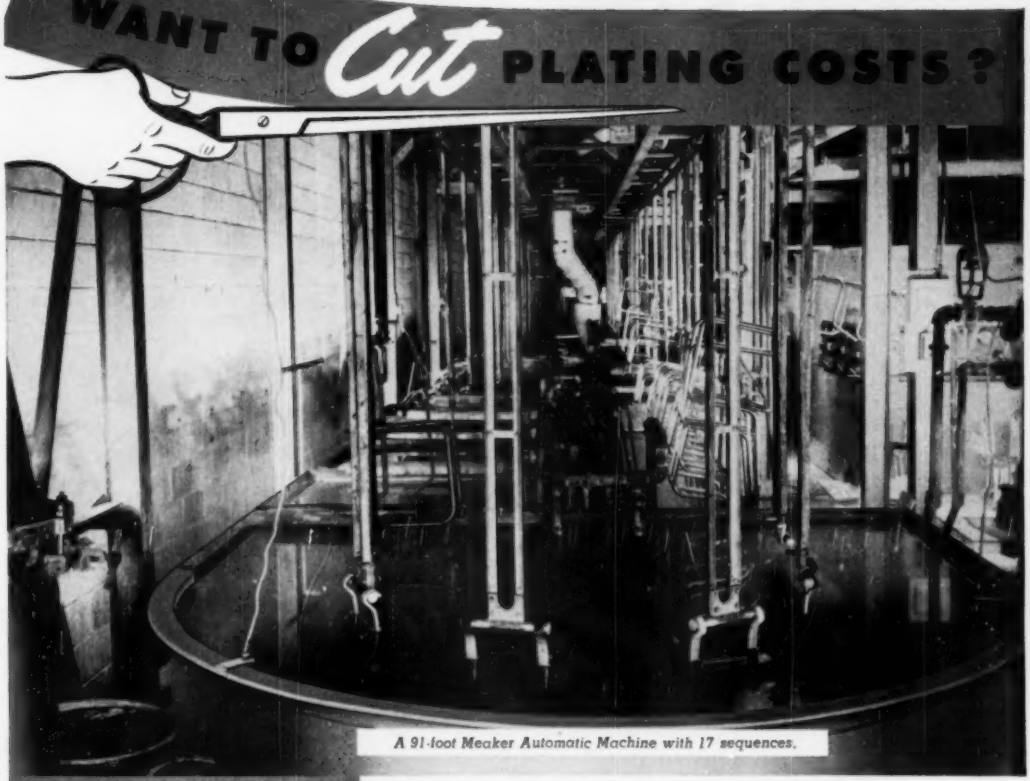


*A 91-foot Meaker Automatic Machine with 17 sequences.*

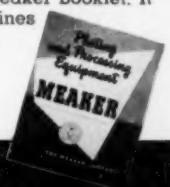
## *Get Results* with a MEAKER PLATING MACHINE

You save three ways with a Meaker plating machine. In many cases the savings in labor costs, space, and chemicals alone have paid for the Meaker equipment in a very short time. Increased production is a natural result. A better and more uniform plating job is assured. Furthermore, cleaner and more agreeable working conditions reduce personnel turnover to a minimum.

A Meaker machine makes every operation in the plating sequence automatic, or as mechanized as possible. It is the profitable way to do electroplating on a competitive basis. Large percentage savings have been the rule both in the plating departments with medium output and in the mass production plants.

Look to the handling methods in your plating work. There may be an opportunity to save a lot of money. Whatever your requirements call for—full automatic, semi-automatic, or a special machine—Meaker has the answer. Get the Meaker booklet. It shows actual installation photographs of machines that have reduced operating costs for others—these machines can do the same for you.

**Ask for Booklet No. 148**

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**THE MEAKER COMPANY**

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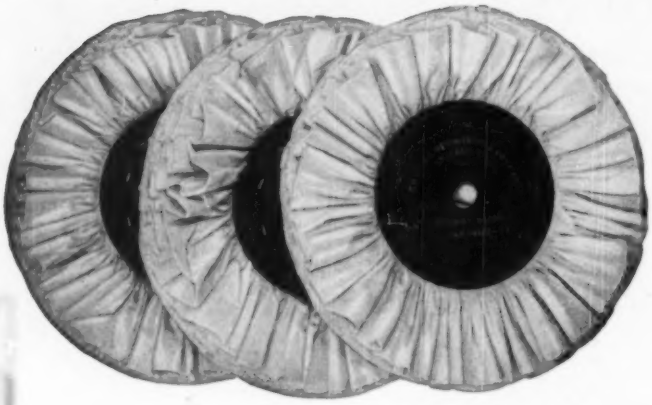

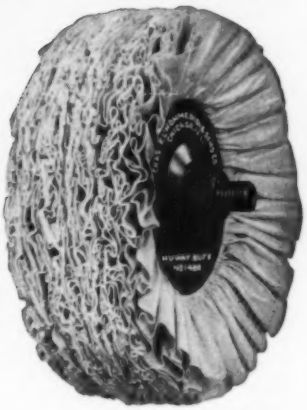

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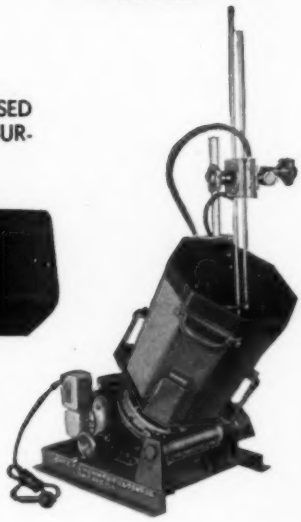
MANY FOLDS TO HOLD COMPOSITION USED FOR FAST CUTTING, FLAT AND ROUND SURFACE WORK.

## EXTRUDED COMPOSITIONS

MORE COMPACT, NO LOSS FROM BREAKAGE, MORE ECONOMICAL.



## RELIANCE MIDGET PLATING BARREL

TUB CAN BE LIFTED OUT FOR DUMPING AND TUMBLING BARREL INSERTED FOR TUMBLING INSTEAD OF PLATING—VERY RIGID—THREE SPEEDS.

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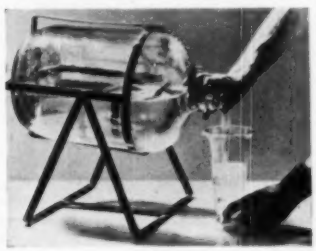
# Equipment and Supplies

**E—497. Drip-Proof Unbreakable Pail**—Said to be practically indestructible, the Ace-Hide 3-gallon chemical pail adds safety to the handling of corrosive solution. According to its makers, American Hard Rubber Company, 11 Mercer Street, New York 13, N. Y., it is a new tough,

resilient high-styrene, copolymer rubber that provides an excellent combination of light weight, corrosion resistance, and strength. Among features are the carefully designed pouring spout, which pours an easily directed stream directly into narrow-necked vessels; the rim design, permitting use of a closefitting, splash-proof cover; and an easy-to-read scale on the inside of the pail, marked off in half-gallons. For further information, use Reader Service Card.

**E—498. Pouring Liquids Without Spilling**—The GS tilter for 5-gallon bottles, manufactured by General Scientific Equipment Company, 2700 W. Huntingdon Street, Philadelphia 32, Pa., is said to provide a safe and easy method of

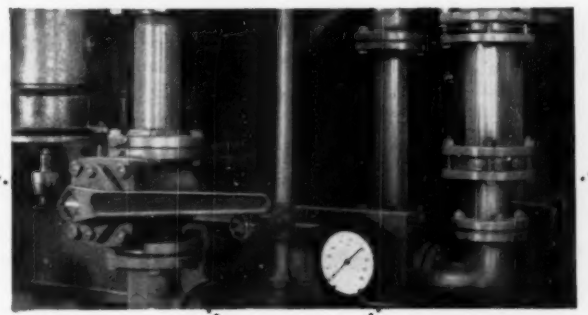


pouring liquids into smaller containers without accidents by spilling or splashing. A chain is provided to hold bottle in position when tilted. The cradle is made of steel. All members are riveted or welded to insure a strong and durable device. For further information, use Reader Service Card.

**E—499. Concrete Floor Coating**—For use where ordinary paints usually take several days to harden against resistance


SARAN LINED steel pipe

combines the corrosion resistance of saran with the strength of steel pipe for longer term operation



Put these two advantages of saran lined steel pipe to work for you! Excellent corrosion resistance plus rigidity and pressure strength—advantages that are important in the reduction of shutdowns and lost production. The ease with which saran lined pipe is field fabricated—involving NO costly delays or special tools—makes it well worth investigating.

When planning for use of saran lined pipe, it is advisable to contact Saran Lined Pipe Company for recommendations on your particular problem.

Saran lined steel pipe is available in lengths of 10 feet and in sizes from 1 to 6 inches. Also available are flanges, fittings and valves. Manufactured by The Dow Chemical Company, Bay City, Michigan, distributed by Saran Lined Pipe Company, Dept. TSP-36.

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## *Equipment and Supplies*

to traffic, the Wilbur & Williams Company, Greenleaf and Leon Streets, Boston 15, Mass., has brought out a tough quickly air-dried clear vinyl coating which gives, according to Taber Abraser test, at least ten times the wear of ordinary coatings. W & W Vinyl Clear Coat Concrete Floor Coater can be applied within four hours upon application of the traffic primer and the traffic resumed within two hours thereafter. Resistance to gasoline, oils, greases, animal fats, and many chemicals is claimed. For further information, use Reader Service Card.

**E—500. Self-contained Portable Dust Collectors**—Three Model "M" unit-type dust collectors are now available from Kirk & Blum Manufacturing Company, 2838 Spring Grove, Cincinnati 25, Ohio. Of 450-, 900- and 1800-cfm capacity at high velocity, they can be set up anywhere to serve one or several grinding, buffing, or polishing machines and eliminate the need for long, costly pipe runs. Each unit consists of motor, exhauster, centrifugal precleaner, and steelwool filter aftercleaner. For further information, use Reader Service Card.

**E—501. Steam-Spray Painting**—Since du Pont announced that spray painting with steam instead of compressed air had the advantages of one-pass application for 2 mils of film (labor saving), increased efficiency through less overspray, and savings of thinner through use of less reduction, engineers of leading manufacturers of spray-guns and other spray-paint equipment have been working to meet the potential demand and impact of this radical change in spray-painting technique.

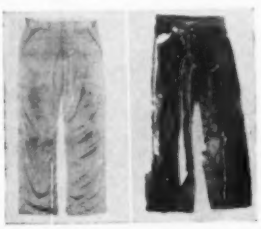
Pioneering in this new application for electric steam, Livingstone Engineering Company, 100 Grove Street, Worcester 5, Mass., announces the Speedylectric SP500, an all-electric steam-power plant complete with built-in 100-psi boiler, A. S. M. E. Code, National Board inspected and stamped, Underwriters' Laboratories listed. The SP500 includes an electric superheater with thermostatic control and boiler feed pump, motor, and controls. It is now available in a range of capacities from 1 to 10 spray guns or larger and operates on 220-440-550-volts AC, single or polyphase. For further information, use Reader Service Card.

**E—502. Gold Lacquers**—The Watson-Standard Company, 225 Galveston Avenue, Pittsburgh 19, Pa., announces a series of gold lacquers suitable for can coatings, cap and closure coatings, crown coatings, and other specialized uses for which sterilizing, chemical resistance, adhesion, and water resistance are required. This series of gold lacquers employs a wide variety of types, depending on the end use. They are primarily based on oleoresinous resins, alkyd resins, vinyl resins, and special gold-lacquer vehicles. For further information, use Reader Service Card.

**E—503. Clear Baking Finish for Brass**—A new anti-corrosive clear baking finish for brass products has been developed by the laboratories of Standard Varnish Works, 2600 Richmond Terrace, Staten Island 3, N. Y. Tests for abrasion, perspiration, and humidity (hardware, cosmetic cases, lighting fixtures, etc.) and for moisture and salt spray resistance (marine fittings, exterior hardware) are said to have shown that the new finish affords outstanding protection in those applications.

Because economy and ease of application are doubly important to the manufacturer of small metal products, Standard engineers have application-tested the finish in pilot-coating operations similar or identical to those used in the industries for which the coating was formulated. For further information, use Reader Service Card.

**E—504. Work Garments**—Extensive plant tests show that savings as high as $100 a year per man can be realized by using industrial and laboratory work garments made with Union Carbide's "Vinyon" N yarn, according to Chem-Wear Corporation, 740 Broadway, New York



3, N. Y., manufacturers of the clothing. Chem-Wear work trousers used by operators in acid plants have outlasted wool and cotton trousers as much as ten to one. Resistance to chemicals is inherent in the fiber; the fabric is not treated. Tests showed no shrinkage and no appreciable change in pliability and hand even after the 20-hour immersion in concentrated hydrofluroic acid, 30 per cent nitric acid (80° C), 85 per cent phosphoric acid (100° C), 70 per cent sulfuric acid (50° C), or 50 per cent sodium hydroxide (100° C). Although not fireproof, Chem-Wear is fire-resistant and will not support combustion. For further information, use Reader Service Card.

**E—505. Handcleaner and Dispenser**—Amaza Laboratories, Box 4114, Cleveland 23, Ohio, has developed an antiseptic industrial di-phase Hand Cleaner that is

said to remove thoroughly industrial hand soil with or without water. The cleaner contains lanolin and no ammonia, alkaline salts, or abrasives. The dispenser has a capacity of 6¾ lb and is sturdily made. For further information, use Reader Service Card.

**E—506. Removing Water from Metal Articles**—A water-remover called Aqua-Off has been developed by the Chemclean Products Corporation, 64 Sixth Avenue, New York 13, N. Y., to remove water from plated or unplated work, such as pieces that have been polished, cleaned in alkali cleaner, and then rinsed in hot or cold water prior to storing or lacquering. For a dry surface, free of water stains, the work is immersed in the Aqua-Off after the final hot-water rinse, gently agitated, and then removed. Water is displaced and falls to the bottom of container, leaving the work free from water but covered with a slight film, which is readily removable in the vapors in a degreaser. This procedure is said to eliminate the use of sawdust or drying cabinets and their attendant difficulties with staining or spotting. For further information, use Reader Service Card.

**E—507. Bench Blast Cabinet for Small Parts**—Designed for abrasive blast cleaning of small parts, such as automobile pistons, dies, tools, castings, a portable bench blast cabinet made by The W. W. Sly Manufacturing Company,

4700 Train Avenue, Cleveland 2, Ohio, will operate on the compressed air supplied by a standard 5-hp 2-stage garage compressor. The operator loads the parts through the top hinged cover and observes the work through the window in the cover. Operator's hands in the rubber gloves rotate the work in the blast stream. A ventilating fan draws off the dust which is retained in a removable filter bag. Efficient vision during blasting is provided by a side-mounted light. Cabinet only requires bench space of 14 x 18 inches. For further information, use Reader Service Card.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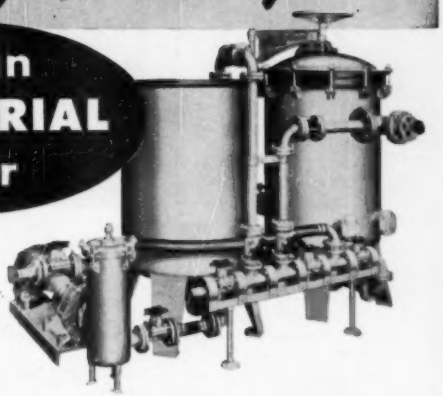

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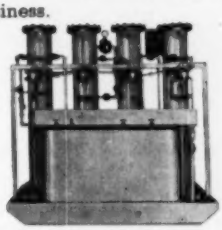

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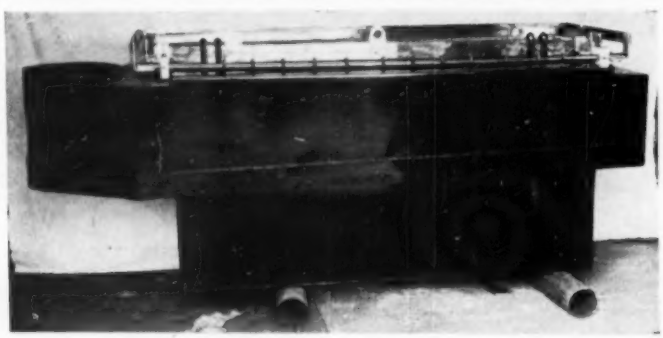

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## *Equipment and Supplies*

**E—508. Colorimeter**—Extensive tests and performance in the field are said to have demonstrated the usefulness of the Leitz Industrial Rouy-Photrometer in routine analysis of water supply, electroplating solutions, diecastings, etc.

This improved photoelectric colorimeter, made by E. Leitz, Inc., 304 Hudson Street, New York 13, N. Y., gives concentration readings in which the inherent functional error is reduced to within 0.1 per cent by careful matching of the photoelectric cell and the microammeter, which results in strict linearity of current vs. light energy.

Operation of the Rouy-Photrometer is rapid and simple, with a single control for all adjustments. Once calibrations have been set up, no special skill or calculation is required of the operator. For further information, use Reader Service Card.

**E—509. Pocket Inspection Comparator**—The Pocket Comparator is said to be a high-precision optical measuring instrument for the inspection of small parts or small dimensions on large parts, permitting the user to compare through a magnifying lens the part to be checked against a finely calibrated pattern or reticle. The reticle of the Pocket Comparator is calibrated for measuring lengths, widths, complete circles, radii and angles. The lens is a triplet-design aplanatic type of great accuracy and has a magnification of approximately 7. The instrument was developed and is manufactured by Bell and Howell Company and is distributed by National Tool Company, Cleveland, Ohio. For further information, use Reader Service Card.

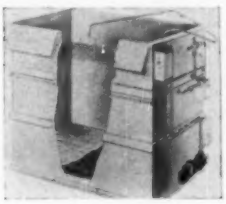
**E—510. Chemical Blackening Salt**—The A. F. Holden Company, New Haven, Conn., and Detroit, Mich., announces the manufacture of a new low-cost blackening salt for carbon steels, stainless steel, cast and malleable iron. The weight of chemicals used is 3 lb/gal. For further information, use Reader Service Card.

# Equipment and Supplies

**E—511. Adherent Lacquers**—Vinrex is the trade name of a new line of specialty coatings, manufactured by Rexton Finishes, Inc., 62 Woolsey Street, Irvington 11, N. J., that are said to adhere exceptionally well to highly polished chromium, brass, aluminum, and zinc plate.

Chromium plated parts finished with one coat of Vinrex white have withstood over 1000-hour water immersion with no loss of gloss or sign of blistering. The coatings are available in clear, black, white and some colors. For further information, use Reader Service Card.

**E—512. Vapor-Spray Degreaser**—A large-capacity Circo vapor-spray degreaser has been announced by Circo Products Company, 6531 Euclid Avenue, Cleveland 3, Ohio. This new Model C-120, designed for the transportation



field and heavy industrial use, has a vapor depth of 84 inches, inside length of 96 inches, and width of 60 inches. It is available in nickel-clad, stainless-clad or zinc-sprayed construction, and the solvent is heated by steam, gas, or electricity. Ample heat input assures a cleaning capacity of 18,000 lb per hour. Depending on size, parts can be removed absolutely clean and dry in 1–15 minutes. An outside water jacket and inside water coils give double protection against vapor loss. Safe, economical operation is provided by a fully automatic control system. For further information, use Reader Service Card.

**E—513. Finish Stripper and Cleaner**—Loncoterge No. 2063 has been developed by the London Chemical Company, 607 Dearborn Street, Chicago 5, Ill., to fill the need for a rapid stripper of high baked acid- and alkali-resistant finishes that will also rapidly remove carbonized films and hard-caked buffing compounds. It is said to strip the most difficult finishes, including baked japan, in 2–5 minutes, where normal time for standard alkali-type strippers is 4–8 hours. This speed is had without resorting to solvents with their toxicity, odor, and explosive hazard.

It is used at 155–225° F, either as received or as a water dilution, depending on the type of finish to be removed. It may be part of a conveyorized painting cycle so that rejected parts can be rapidly stripped and re-cycled to the paint-spraying booths and ovens. For further information, use Reader Service Card.

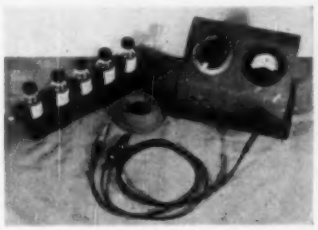
**E—514. Panel Ventilation Filter**—The latest addition to the line of Staynew Dry Panel Filters is the model WKE-8 filter, 24 x 24 inches square by 8 inches deep, providing an active filtering area of 28 sq.ft. The medium most generally used is six- or ten-ply Feltex paper. Other media are available for special conditions. The complete unit consists of a die-cut and stamped heavy-steel cell and frame with heavily galvanized screen as a permanent form to support the filter medium. Lifting handles and cam-type locking latches are supplied as standard equipment. A mechanical loading machine is available for quick, easy loading of replacement media. For further information, use Reader Service Card.

**E—515. Preventing Corrosion of Electrical Wiring in Metal Finishing Plants**—Corrosion of electrical wire and cables in the plating and pickling rooms may be prevented by encasing them in Tygon Flexible Tubing manufactured by the United States Stoneware Company, 60 E. 42nd Street, New York 17, N. Y. Besides fully resistant to the action of all the corrosive fumes and solutions encountered in metal finishing plants, Tygon is also said to be nonoxodizing, nonhardening, and nonaging. The initial cost is low. For further information, use Reader Service Card.

**E—516. Acid and Alkali-Proof Materials**—Tanks and Linings, Ltd., Town Wharf, Droitwich, Worcester, England, announces a new and complete line of acid- and alkali-proof cements, coatings, linings, paints and plastic materials of construction to solve the corrosion problems of many industries, including steel-mill pickling, plating and electrotyping, galvanizing and retinning, and glass and mirror manufacture. For further information, use Reader Service Card.

**E—517. Comfort in Protection Clothing**—A new fabric, Gre-Lite, has been developed by Standard Safety Equipment Company, 232 W. Ontario Street, Chicago 10, Ill., which is said to combine protection, comfort, and durability. The new fabric provides resistance to a wide range of chemicals. With Gre-Lite compound, it is possible to completely seal over garment seams and prevent chemical seepage. The material is more than 40 per cent lighter than the ordinary impervious fabric and extremely flexible. Resistance to abrasion and to mildew or rot are other features claimed. For further information, use Reader Service Card.

**E—518. Metal and Alloy Identification**—A portable metal- and alloy-identification instrument known as Electrospot has been developed by Electrochemical Instruments Laboratory, 532 Woodland Avenue, Mountainside, N. J. This instrument, which weighs less than five



pounds and requires no external power source, makes use of the inherent differences in the surface films ever present on metals and alloys. Small items are identified by dipping a portion in an electrolyte and large items by pressing a test probe against the material. Reading a dial setting after rotation to a "zero" deflection on a millivolt meter identifies the alloy. For rapid sorting, when a predetermined dial setting is used, a testing rate as high as 1,000 pieces per hour under production conditions is possible. As identification is based solely on chemical composition previous heat treating history of the alloys can be ignored. Electrospot has been applied to the sorting of alloys of aluminum, copper, gold, iron, lead, nickel and various stainless steels and to identification of electrodeposits. For further information, use Reader Service Card.

**E—519. Lined Barrels**—Schori Process Division, Ferro-Co Corporation, 8–11 Forty-third Road, Long Island City 1, N. Y., offers 30- and 50-gal Hackney open-head seamless barrels, lined with 1/32 or 1/8 inch thick polyethylene. The drums

are said to eliminate the high damage potential of crocks and glass vessels to personnel and equipment and be priced lower than comparable rubber-lined drums.

Schori Process Division specializes in lining tanks and other equipment with polyethylene by the Schori Flame Spray process. Polyethylene coatings are corrosion resistant against practically all chemicals. For further information, use Reader Service Card.

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# plating


JULY 1950 VOL. 37 NO. 7


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# Editorial

## Tolerance

WHEN WE HEAR the word tolerance we may think of human relations and the necessity for making allowances for the imperfections of our fellow men. The same word may also bring to mind the variations from a specified dimension permitted in machinery and the high cost of small tolerances.

The word tolerance also has a meaning in electroplating. No bright-plating solution, for example, has practical value, however brilliant a plate it may be capable of producing, unless it does so over a range of current densities, temperatures, impurity contents, etc. This ability of the bath to perform under differing conditions may be termed its tolerance.

It should be recognized that the required tolerance varies from one plant to another. This is what the plater means when he insists that his shop is "different". There are differences in quality and availability of water, in cleanliness as affected by building construction, in shop temperature during winter and summer, and in personnel, to mention only a few. These factors are not constants but vary from time to time. The worse the conditions and the greater the variability, the more tolerant must be the plating bath, especially if inspection standards are high.

Similarly, the whole plating cycle must tolerate variations in base-metal quality and cleanliness, especially in a fullautomatic machine with its rigidity. A few extra steps are always desirable to insure continually good performance. And tanks should be built big enough to handle not only this year's models but also next and later years'.

Providing needed tolerances, therefore, is not a matter of choice but of necessity if quality is to be maintained at the desired level without excessive operating costs. It is a basic principle from which no deviation can be tolerated.

Gustaf Soderberg

# NICKEL IMMERSION COATINGS

## *by electrochemical displacement and by chemical reduction*

W. A. WESLEY

*Assistant Director, Research Laboratory*
*The International Nickel Company, Bayonne, New Jersey*

INQUIRIES ARE RECEIVED from time to time regarding methods for depositing nickel coatings without the use of electrodes and electrolysis. The objective is generally to coat inaccessible surfaces of objects difficult to electroplate, such as the inside of tubular parts, or else to avoid making the large investment for generators and auxiliary equipment required in plating. The tenor of some of these inquiries has indicated a lack of understanding of the nature, relative advantages, and limitations of the simple displacement process as compared with the chemical reduction process and with nickel plating in the normal manner with electrolysis. It is hoped that a review of available data and presentation of some unpublished observations on "electroless" coatings will help dissipate any remaining confusion regarding these methods.

### Displacement Process

When well cleaned steel is immersed in a solution of a nickel salt there is a tendency for deposition of a nickel coating by electrochemical displacement as follows:

$$Fe + Ni^{++} \rightarrow Fe^{++} + Ni \qquad \text{(Reaction 1)}$$

Optimum conditions for formation of a bright coating are given by Wesley and Copson[1] as follows:

| | |
|---|---|
| Nickel chloride | 80 oz/gal (600 g/l) |
| Boric acid | 4 oz/gal (30 g/l) |
| *p*H | 3.5 to 4.5 |
| Temperature | 160° F (70° C) |
| Motion | Desirable but not essential |

The thickness of coating increases with time of immersion as shown in Fig. 1. Deposition probably commences at local cathodic points of the steel surface, making them remain cathodic and making the anodic areas self-perpetuating. As the deposit thickens polarization occurs at the local anodes and within the pores leading from them. The rate of deposition decreases with time so that it is impractical to deposit coatings much thicker than 30 millionths inch (0.75$\mu$) commercially.

As shown by reaction 1 an equivalent amount of iron dissolved in the nickel chloride solution for every ounce of nickel deposited, and it is necessary to remove this iron from the bath to keep the ferrous ion content below about 0.7 oz/gal (5 g/l). The nickel content of the bath must be replenished, and this can be done by treating it with finely divided nickel powder. More complete operating details have been published[1].

The immersion deposits are quite porous and must be heat treated to decrease porosity and increase adhesion. Interdiffusion of iron and nickel can occur during the heating cycle, so the latter is designed to provide or avoid diffusion depending upon the use to which the product will be put. If the nickelized steel is to be used as a base for organic coatings, tests show that a mild annealing treatment of 45 minutes in a nonoxidizing atmosphere at 1200° F (650° C) gives best results, whereas if a long life out of doors is desired a 48-hour diffusion anneal reaching a maximum temperature of 1400° F (760° C) is indicated as a good choice[1].

### "Electroless" Plating

The process for controllable catalytic reduction of nickel to form adherent nickel deposits was developed by Brenner and Riddell[2,3]. In this method metal deposition is caused by a chemical reducing agent (so-

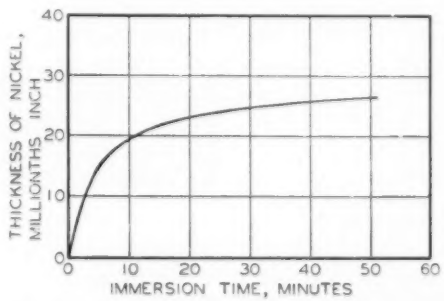



*Fig. 1. Thickness of displacement nickel coating as function of time of immersion*

dium hypophosphite) added to a buffered solution of a nickel salt. In the hot solution (190° F; 90° C) the reducing agent itself is not very stable and tends to reduce water to hydrogen gas. The reactions are:

$$NiCl_2 + NaH_2PO_2 + H_2O \rightarrow Ni + 2HCl + NaH_2PO_3 \quad \text{(Reaction 2)}$$

sodium hypophosphite — sodium acid orthophosphate

$$NaH_2PO_2 + H_2O \rightarrow NaH_2PO_3 + H_2 \quad \text{(Reaction 3)}$$

Reaction 2 does not take place spontaneously under practical conditions; but nickel will deposit only upon certain surfaces, such as iron or steel, gold, cobalt, aluminum, or palladium. Fortunately, nickel itself is a good catalyst also, so that the process is not self-stifling like the displacement method and the thickness of deposit is not limited. There are various ways of inducing deposition on noncatalytic surfaces, such as copper, brass or lead[3,4], but these need not be reviewed here. It should be noted that no dissolution of the basis metal is required to cause nickel deposition in this process.

A high rate of deposition can be achieved from an alkaline bath, but this bath has practical drawbacks which make it less convenient and less economical than baths with an acid reaction. Brenner and Riddell[2] give complete details, including the following representative conditions for deposition of semibright nickel on a well cleaned steel surface:

| | |
|---|---|
| Nickel chloride, $NiCl_2.6H_2O$ | 4 oz/gal (30 g/l) |
| Sodium hypophosphite ($NaH_2PO_2.H_2O$) | 1.3 oz/gal (10 g/l) |
| Sodium citrate ($Na_3C_6H_5O_7.5\frac{1}{2}H_2O$) | 1.3 oz/gal (10g/l) |
| Temperature | 194° F (90° C) |
| *p*H | 4 to 6 |
| Rate of deposition | 0.0002 inch (13$\mu$) per hour |

The steel parts are simply immersed in the hot solution and gently agitated. The *p*H tends to drop in accordance with reaction 2, and for continued rapid deposition additions of a dilute sodium hydroxide solution must be made. Sodium hypophosphite is added only when needed, since loss by reaction 3 tends to take place in the presence of nickel salts. To make the process continuous, however, both the reducing agent and nickel salts must be replenished from time to time.

## Nature of the Deposit

*Displacement Nickel.*—The only large-scale process in which nickel is displaced from solution by steel is the nickel dip, or nickel flashing, treatment employed in the ceramic enameling industry to insure good adhesion of the enamels to the steel. The thickness of nickel generally applied for this purpose is only 2–5 millionths inch (0.05–0.125 $\mu$). Until recently there was no certainty as to the nature of the nickel deposit, some holding the opinion that it was a nickel oxide, some a basic compound, and others metallic nickel. The work of Wainer and Baldwin[4] established that even these extremely thin deposits are essentially metallic in nature. They also showed that in order for good enamel adhesion to develop there must be interdiffusion of the nickel and iron during the preheating and firing of the ware so that a nickel-iron alloy is definitely formed at the surface of the steel. Specimens of steel coated with 13-millionths-inch (0.32-$\mu$) immersion nickel which has been heated to 1400° F (760° C) in a 48-hour box-annealing cycle were submitted to Wainer and Baldwin for use in their stydy of enamel adhesion[5]. Their work showed that the surface layer on the steel was probably a nickel-iron alloy rather than pure nickel.

It seems reasonable to conclude, therefore, that the electrochemical-displacement, or simple-immersion, nickel deposit is pure nickel and that this layer becomes alloyed with more or less iron during the heat-treating process employed to reduce porosity and improve adhesion of the coating.

*Electroless Nickel.*—The electroless nickel coating is definitely not pure nickel. It contains at least 3 per cent phosphorus, and a determination in the author's laboratory indicated that as much as 11.4 per cent P may be present without loss of metallic appearance of the coating. The phosphorous is probably present as a nickel phosphide[2]. A rough guide to the amount of phosphide present is the magnetic response of the nickel. With 3 per cent phosphorus the deposit is definitely less magnetic than Watts nickel while with 11.4 per cent the nickel layer is not ferromagnetic at all[6]. This point must be born in mind in attempting to measure thickness of electroless nickel by use of the Magne-Gage.

The microscructure of electroless coatings 0.005 inch (125 $\mu$) thick shows numerous well bonded laminations running parallel to the basis metal and within each layer a columnar structure perpendicular to the basis metal[3,6].

## Physical Properties

The *displacement nickel* deposits are so thin that not much has been determined concerning their physical properties. The nickel is quite porous and nonadherent as deposited but is of the same degree of smoothness and brightness as the steel surface upon which it is formed. After annealing to sinter the coating, reduce porosity, and establish adhesion, the surface assumes a white matte appearance. When severely bent the coating of iron-nickel alloy cracks but does not flake off[1].

*Electroless nickel* is bright if deposited from the alkaline bath but semibright or matte from the acid solution. Good adhesion can be obtained to steel by standard cleaning and etching treatments prior to immersion in the acid electroless bath. Quantitative adhesion tests by the Knapp method[7] showed a value of 59,000 psi (41.5 kg/mm$^2$) for a matte acid nickel on steel and 31,200 psi (21.9 kg/mm$^2$) for a bright alkaline

deposit[6], the latter value not representing the full strength of the bond since the break occurred in the interface between the electroless nickel and a heavy layer of electrolytic nickel used to build up the sheet for machining into test specimens.

The hardness of electroless nickel is greater than that of electrodeposited hard nickel, running about 500 Knoop hardness in deposits from the acid bath. They have the interesting property of increasing in hardness upon suitable heat treatment, for example, heating at 750° F (400° C) for 30 minutes raised the hardness number to 800. The effect is probably due to precipitation of nickel phosphide since overheating at 1470° F (800° C) causes visible agglomerization of phosphide with a drop in hardness[3].

Electroless nickel is brittle as deposited, but if its phosphorus content is not too high it becomes ductile upon heating. Tests in the author's laboratory indicate that the phosphorus content should be limited to as low a value as possible if the coated parts are to be welded, otherwise the weld metal may be embrittled by phosphorus[6].

As indicated earlier the magnetic response of nickel varies with its phosphide content—with 11 per cent phosphorus the metal is nonmagnetic.

## Protective Value

It should be clear at this point that the thin nickel deposits made by the *displacement* method are not suitable for a decorative bright metal finish. Like thin tin coatings the nickelized surfaces should be oiled to avoid rusting in shipment or storage. In outdoor atmospheres the nickelized steel rusts readily, but if the coating is well diffused by prolonged annealing the rust coating which forms upon weathering becomes darker, thinner, of finer texture, and more protective while the weight loss due to atmospheric corrosion is greatly reduced below that of the same steel without a coating[1].

The displacement nickel coating provided remarkable protection to steel in "underfilm" corrosion tests in which the specimens were coated with a baked, Vinylite-type lacquer and exposed in a constant-humidity room. In this case a *mild* annealing treatment in the nickelizing process was superior and coatings of nickel only seven millionths inch (0.17 $\mu$) thick showed a pronounced beneficial effect[1].

The *electroless nickel* coatings are quite different. They can be made several mils* thick if desired, hence are suitable for decorative and other uses. Their protective value is to be compared with regular nickel electrodeposits rather than with displacement coatings. Peculiarly enough, the gross porosity of electroless nickel coatings one mil (25 $\mu$) thick, as shown by salt-spray and ferryoxyl tests, is about the same as that of electrodeposited Watts nickel[3,6]. Unfortunately, no results of outdoor-weathering tests are available for these coatings. Whether or not the phosphorus content of nickel would have any influence upon its resistance to more severe corrosives is also a moot point which should be investigated.

## Efficiency

The efficiency of the *electrochemical displacement* process is close to 100 per cent, if calculated on the basis of reaction 1. The chemicals cost would therefore be moderate, but to that must be added the cost of heat treating the product.

To deposit a pound of nickel by the *electroless process* requires consumption of from 5 to 9 pounds of sodium hypophosphite, representing 37 to 20 per cent efficiency. The price of sodium hypophosphite is rather high because it is not made in very large quantities, the quotation in October, 1949 being about 85 cents per pound for a pharmaceutical grade. A technical grade suitable for the electroless process can be made at a lower price depending upon the tonnage demand.

## Potential Applications

The two processes for nickel coating which have been described are not competitive with each other, nor hardly so with electroplating. They must be considered special-purpose methods. The *displacement process* is limited to preparation of coatings under 50 millionths inch (1.25 $\mu$) thick on an iron or steel base. It is visualized as an inexpensive method for making a nickelized steel superior to mild steel as a base for other coatings, such as ceramic enamels, organic and conversion coatings, and outer layers of tin or zinc. For example, patents issued to the Pyrene Company, Ltd.[8] and to H. T. Davies[9] claim improved coatings for steel in which a thin nickel deposit forms the base for a phosphate coating.

The first reaction to the *electroless process* was that it would be too expensive for broad use; however, the advantage of uniform metal deposition regardless of shape of the object being plated is an important one and in special cases may prove to be determinative. Suppose that it were necessary to coat the interior of an intricate apparatus with nickel and that the methods of fabrication would prevent preplating the parts with nickel before assembly; the advantage of being able to deposit nickel uniformly over the entire interior could well justify the cost. Other situations can be imagined where a coating must be applied in the field or in a plant not equipped for electroplating when the ability to deposit nickel without purchase of current generators, control equipment, racks, and purifying tanks might be most economical. The electroless process should be likewise applicable in treating objects of the small sizes normally plated in barrels whenever an internal as well as external coating is required. Fine instrument gears, pinions and bearings of steel are examples of parts in this class which cannot be uniformly coated in any other way

(*Continued on page 756*)

*1 mil = 0.001 inch = 25.4 $\mu$.

*leaders*

*in the*

*industry xxvi*

# a. h. durose

ARTHUR H. DUROSE, who bosses electroplating development for The Harshaw Chemical Company, was born in Flint, Michigan in 1912 and received his early schooling in that city. He went to Graceland Junior College in Lamoni, Iowa, where he was president of the Engineers' Club and from which he graduated with high honors, receiving the cup awarded to the outstanding engineering student. From Graceland the road went to Michigan State College. Here he became interested in electro- and colloid chemistry under Dr. D. T. Ewing and was elected a member of Tau Beta Pi, National honorary engineering society. He worked on two thesis problems—manufacture of alcohol from sawdust and properties of photovoltaic cells—and graduated in 1934 with the degree of Bachelor of Science in Engineering.

For a little over one year he was employed by Chevrolet-Flint on tin plating of pistons and chromium plating of tools, dies and gauges. He then moved to Cincinnati to continue his studies with the aid of a graduate assistantship. His studies there and his thesis on electrolytic preparation of percarbonates led to a Master of Science degree in 1937.

From Cincinnati Mr. DuRose went with The Harshaw Chemical Company of Cleveland, where he has been employed ever since. Except for the war years, when he worked on Manhattan District projects, he has been closely associated with Harshaw's electrochemical and plating research, development, and technical service, and recently was made Manager of Electroplating Development. During the latter part of the war he was associated with a War Metallurgy Committee for evaluating and stimulating the use of lead deposits, and this developed into an active interest in Committee B-8 of A. S. T. M. He is now chairman of the section of thickness measurement of this Committee, as well as a member of Project Committee No. 7 on Methods for Testing Thickness of Electrodeposits of the American Electroplaters' Society's Research Committee.

Mr. DuRose holds a number of patents on chemical manufacture, alloy and nickel plating, and has presented numerous papers about leveling and buffing, impurities in plating solutions and purification, nickel-iron alloy plating, lead-tin alloy plating and protection, etc., at A. E. S. conventions and Branch meetings. In addition to A. E. S. and A. S. T. M. he is a member of the American Chemical Society, The Electrochemical Society, and American Society for Quality Control. Much of his energy in the last few years has been spent on the development and commercial application of the Perflow Process for the deposition of smooth, easily buffed nickel. He is co-author of the chapter on Acid Tin Plating in the revised edition of "Modern Electroplating", now in preparation.

He lives in Euclid, Ohio, on Lake Erie with his wife, Helen Doran, whom he married in Flint in 1935, and their three children: Dick, 12; Barbara, 8; and Betty 3. Being fascinated by his work, he has little time for outside activities or for hobbies. In the summer, however, his spare time is used in fishing, boating and an occasional game of golf or tennis.

# Creating Modern SILVERWARE

**Part I**

THE MANUFACTURE of silver plated ware is an old business, almost as old as electroplating itself. The original silver plater, Elkington in England, however, would undoubtedly be amazed at the strides in mechanization and control that have been taken since he received his patent on the silver cyanide bath in 1840.

Almost equally interesting as this story about plated silverware is the story about the company from which it emanates. Oneida Ltd. of Oneida, N. Y., has its roots in Oneida Community. It was one of the many selfcontained religious farming communities, practicing the cooperative life of the early Christian Church, which grew up in the United States during the middle of the last century. Unlike other groups of its kind, the Oneida Community was progressive. When it found that it could not exist on farming, it turned to manufacture of canned goods, animal traps, spun silk, tinned iron spoons, and, in 1877, silverware. Other items were added and dropped from time to time.

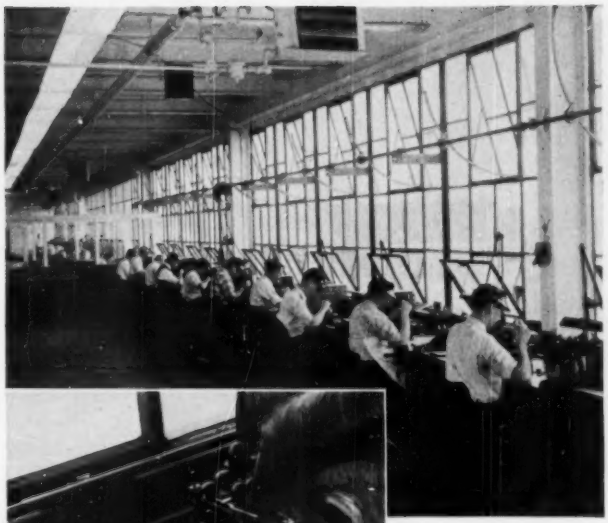
With the reorganization of the Community into a joint stock company, Oneida Community Limited, in 1880, emphasis was laid on silverware as being the one business of the company that offered an opportunity for nation-wide distribution. The other businesses were gradually disposed of, the last, the steel-trap business, in 1925.

To promote the silverware business the company took several steps which at the time were revolutionary. Knowing that the cost of silver was then a minor item in the total cost of tableware, it standardized on a higher grade than then available, the "triple plus" grade carrying over 6 troy ounces of silver per gross of teaspoons. Fair profits were assured to both jobbers and retailers. Last but not least, the company went in for full-page advertising in national journals, using smart motives that appealed to the younger generation.

Although the Community had turned into an efficient company and its members into stockholders, the old idea of sharing continued. Much of the company's success can be attributed to the sense of participation which the employees enjoy. With high wages, opportunities to acquire homes of their own at low cost, good schooling for the children, pensions, and profit bonuses, the employees never formed a union and have stood by the company through thick and thin.

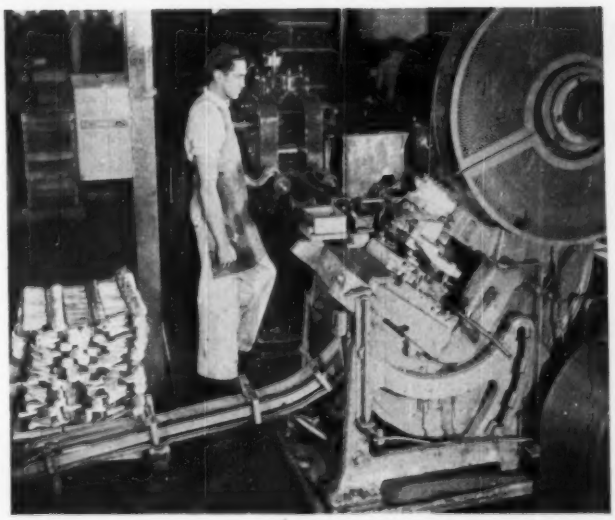
That is, in short, the story of the company. Now comes the first half of the story of its products, as told by Mr. Frank C. Mesle of the Works Laboratory of Oneida Ltd., the company's name since 1935. The second half will follow in the August issue.

**The first step** in the creation of a product is the development of an attractive and functional design.

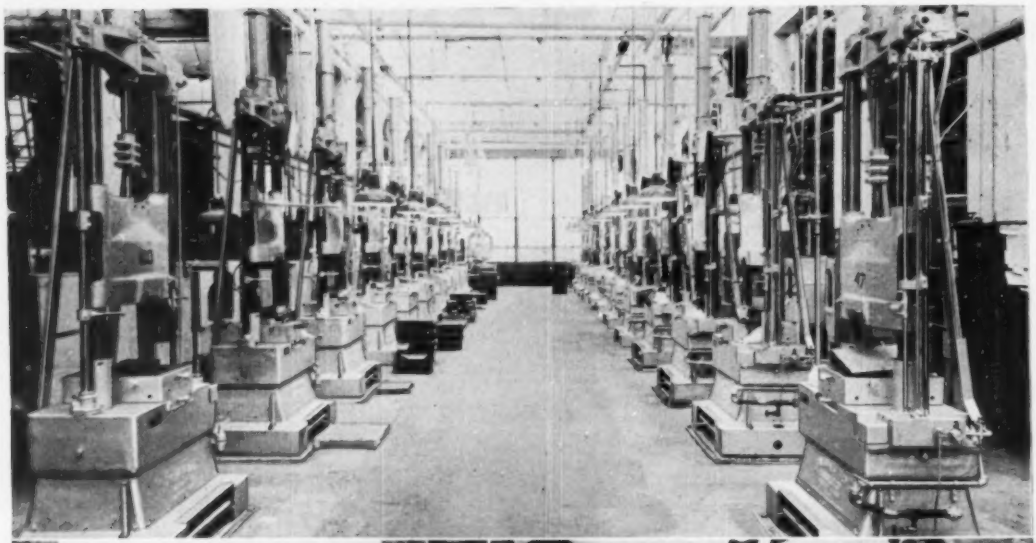


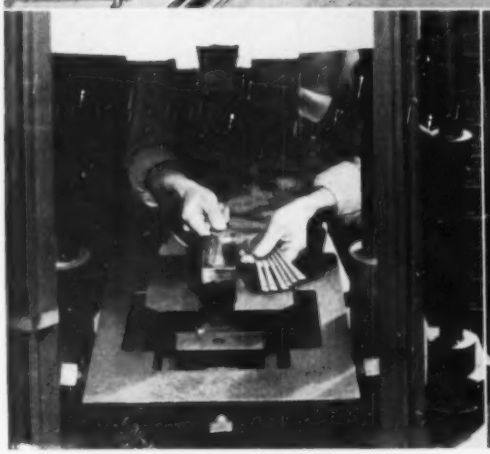
**Art and craftsmanship** meet when the die maker transfers the design to steel dies.

**Blanking** is the first actual operation in the manufacture of tableware. Nickel silver containing 18 per cent each of nickel and zinc, remainder copper, is the metal used.



**In this semiautomatic grading-roll** and cutting-press operation, spoon and fork blanks are placed into a hopper by hand, fed automatically between a series of grading rolls (at back) to obtain their varying thicknesses, discharged onto a belt, and carried into a cutting press (at front) to be cut to outline. On their way from the press they are packed into bundles, while the trimming scrap is kicked onto a belt back of the press and is carried to a scrap container. (See also Cover).





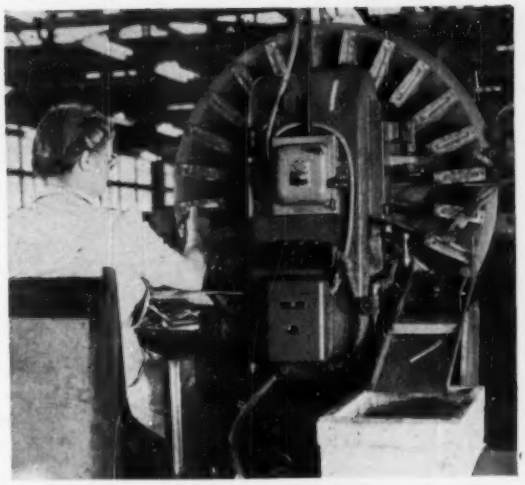
**Lines of air-operated drop hammers** (*top*) serve to emboss the pattern on handles (*lower left*) and to shape the bowls of spoons (*lower right*).

←

**Halves of hollow handles** for knives are also formed and embossed with the die pattern in the drop hammers.

**Clockwise:**

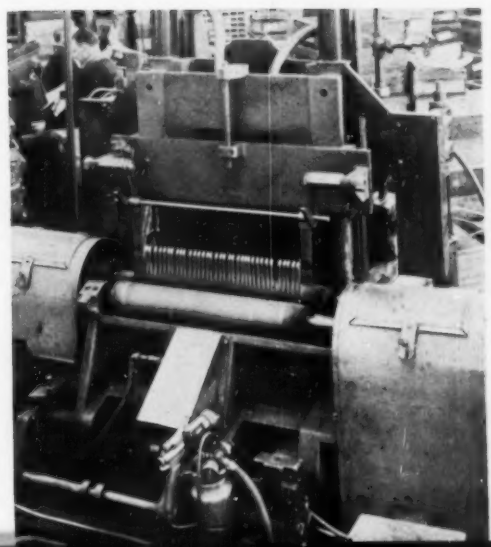
**Having been trimmed,** the hollow-handle halves are placed in dies in a semiautomatic grinder and carried against emery-coated belts to have their edges faced. They are then dropped into trays.



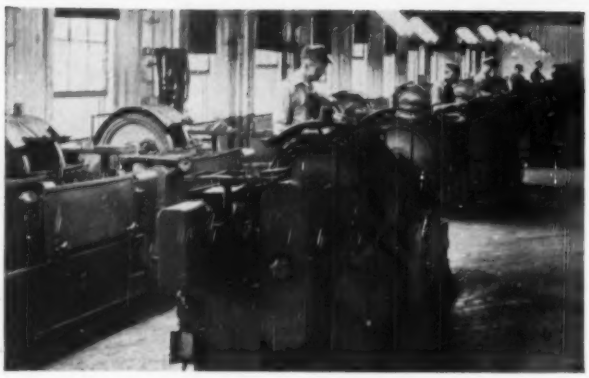
**Two half-handles** are tied together, a piece of silver solder is placed inside, and the handle is passed through a furnace which melts the solder, joining the halves.

**The continuity** of the brazed joint is tested by forcing compressed air into the handle while it is submerged under water. Any bubbles indicate poor brazing.

**The hollow handles** are polished on an automatic machine where they move up and down between polishing wheels. Abrasive in liquid is sprayed onto the wheels.



**Knife blades,** as well as complete knives, are made from steel rods forged to shape and trimmed. Here the knife blades are "water ground" against emery wheels with water running over the grinding surface to cool it. One man feeds a battery of "water grinders".



**"Glazing"** is the next step after "water grinding". One man will feed a group of "glazing" machines, having canvas wheels coated with fine emery.

**The "flashing",** in which the sparks fly, removes the black and burrs from edge of knife blades. An emery wheel is used for this operation.

**All hollow-handle knives** are inspected for "leakers". After handle and blade have been joined by soldering, they are immersed in hot water, which causes the air in the handle to expand and give rise to bubbles if there is a hole through the solder.

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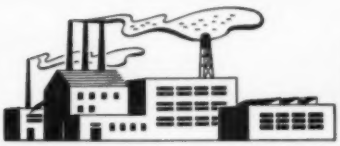

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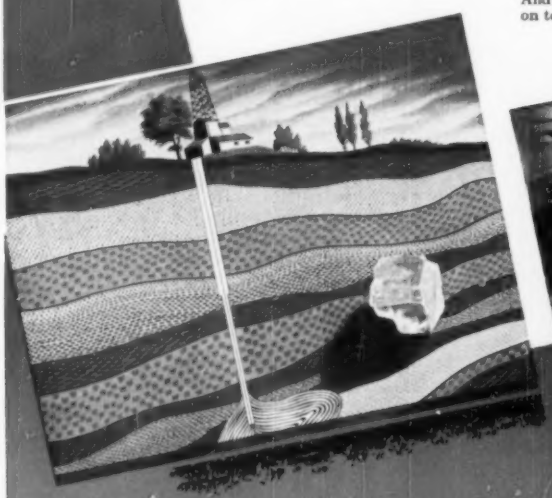

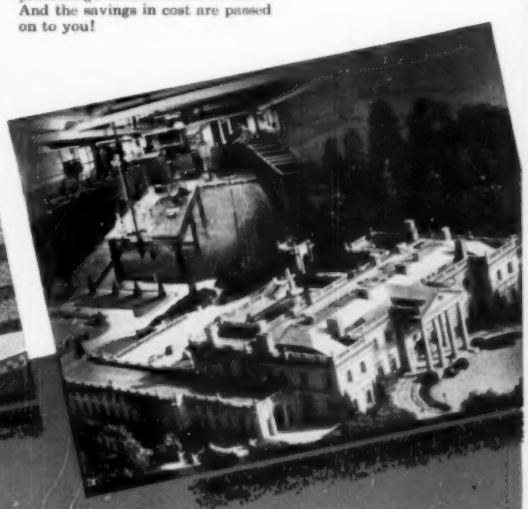

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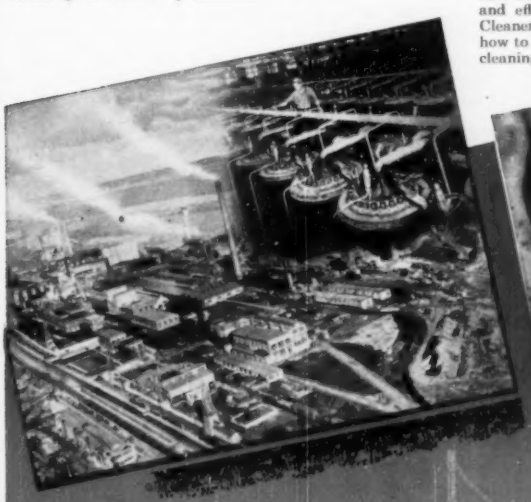

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SAMUEL HEIMAN

*Chief Chemist, Philadelphia Rust-Proof Company, Philadelphia, Pa.*

### A. EVALUATION OF METHODS IN GENERAL USE

#### Introduction

In Part I of this series†, it was shown that whereas there are many methods in the literature for determining the free cyanide in a brass plating solution, no single procedure is generally accepted. The initial phase of the experimental work, therefore, consisted in studying the procedures in most common use in order to (1) compare the values for free cyanide obtained by the different methods on a given brass bath and (2) to evaluate critically the experimental techniques, advantages, and disadvantages of each method.

Data thus obtained should enable one to select the best available method and possibly to improve upon it. It was recognized that the "absolute" value for free cyanide is not obtained by any method suggested to date. Consequently, the criterion of a preferred method would be that (1) the results are the least affected by variations in experimental techniques and composition of the baths and (2) the procedure is the simplest and most easily reproducible.

#### Experimental

The following methods were evaluated:

Direct titration methods

1. Guidebook[28]
2. Pan[29]
3. Blum and Hogaboom[75]
4. Experimental method

Indirect titration methods

5. Heiman-McNabb[38]
6. Clarke[37]

Calculation method

7. Coats[43]

Details of these methods were given in Table II (Part I of this series), except of method 4. This method, which was the result of preliminary work, consisted in adding to a 10-ml sample 10 ml of a 25 per cent solution of potassium iodide (equivalent to 2.5 g KI and about 10 ml added water) and titrating with 0.1-N silver nitrate at 30° C.

The first brass solution studied was bath B, a typical low-concentration brass bath[39]. The results were so unexpected that it was decided to extend the investigation to a total of four brass baths of widely widely differing metal concentration. The solution makeup, from commercial chemicals, and the average of closely agreeing anlyses in duplicate or triplicate are given in Table III. "A" is a commercial brass-coloring bath which had been in operation for about two years. "B" is a typical low-concentration, low-speed brass bath. "C" is an arbitrarily chosen composition, intermediate between "B" and "D" in zinc content. "D" is a high-speed brass bath containing Rochelle salt and added ammonia‡.

The free cyanide content of each bath as determined by the methods given above are presented in Table IV.

#### Discussion of Results

*Direct Titration Methods.*—As seen from Table IV there are considerable differences in the results by the four direct-titration methods, caused primarily by differences in the dilution of the samples: the greater the dilution, the higher the value for free cyanide. Increasing the dilution also makes the end point hazier; the end point in method 1 was very hazy, while that in method 4 was very sharp.

Of the four methods, the lowest results were obtained by method 3, and this is due to the removal of the sodium carbonate in the brass-bath sample prior to the titration with silver nitrate. However, the end point with this method was not as sharp as in method 4 because of the much larger dilution of the original sample.

*Indirect Titration Methods.*—In these methods, sodium hydroxide is added to the sample prior to the titration with silver nitrate; consequently both the free cyanide and the sodium cyanide equivalent to the cyanide in the zinc complex are titrated. Methods 5a and 6a assume that the zinc complex is $Na_2Zn(CN)_4$, and the free cyanide is obtained by difference.

Since the results by these methods were much lower than those by the direct-titration methods and nega-

*High copper-zinc alloy. †Published in the May, 1950 issue of Plating.

‡The presence of Rochelle salt was found not to affect the results by the direct- or the indirect-titration method. The presence of 5.0 g/l ammonia had no effect on the indirect-titration results, but gave high values by the preferred direct-titration method.

TABLE III. COMPOSITION OF BRASS BATHS

| Constituent | Bath A* g/l | Bath B g/l | Bath C g/l | Bath D g/l |
|---|---|---|---|---|
| | | Makeup† | | |
| Copper Cyanide | .... | 31.5 | 53.4 | 53.6 |
| Zinc Cyanide | .... | 11.5 | 21.7 | 29.2 |
| Sodium Cyanide | .... | 50.5 | 77.6 | 88.2 |
| Sodium Carbonate | 20.0 | 30.0 | 30.0 | 30.0 |
| Rochelle Salt | none | none | none | 45.0 |
| Ammonia ($NH_3$) | .... | none | none | 5.0 |
| | | Analysis‡ | | |
| Copper | 26.9 | 22.60 | 36.07 | 38.70 |
| Zinc | 0.377 | 6.31 | 11.43 | 15.95 |
| Total Sodium Cyanide | 79.87 | 73.10 | 118.2 | 128.0 |
| Sodium Carbonate | 20.2 | ..... | ..... | ..... |
| Ammonia ($NH_3$) | 1.81 | ..... | ..... | ..... |
| Iron | 1.40 | none | none | none |
| *p*H (Electrometric) | 10.50 | 10.90 | 10.42 | 10.50 |

*A commercial bath to which sodium carbonate was added.
†From chemicals of technical grade.
‡The following references give the methods used in the analyses: Copper[46], zinc[47], total sodium cyanide[28], ammonia[48], iron[47].

tive for bath D, the data were recalculated on the basis of a zinc complex $NaZn(CN)_3$; these results are also given in Table IV as by methods 5 and 6.

*Calculation Method.*—The values for free cyanide were calculated for each brass bath from the experimentally determined values for total cyanide, copper, and zinc in Table III, assuming the copper complex $Na_2Cu(CN)_3$ and the zinc complex $Na_2Zn(CN)_4$ (method 7a) or $NaZn(CN)_3$ (method 7). The results, given in Table IV, may be considered the basis of comparison for all other methods.

The fairly close agreement between the values obtained by indirect-titration methods 5 and 6 and calculated method 7 is indeed striking.

It might appear from these data that the free cyanide obtained by the indirect-titration methods and by the calculation method is in excess of the cyanide held in the complexes $NaZn(CN)_3$ and $Na_2Cu(CN)_3$ instead of $Na_2Zn(CN)_4$ and $Na_2Cu(CN)_3$. This was Pan's theory[20]. However, results of this nature do not provide proof that these complexes actually exist in the brass bath or even in the sample at the end of the titration. More likely, $NaZn(CN)_3$ is only the simplified equivalent of several zinc cyanide and zincate complexes. Further study of this subject was indicated.

## B. STUDY OF DIRECT TITRATION METHODS

The direct-titration methods have the great advantages of simplicity and economy of time, and they were therefore studied first to account for the divergencies obtained and to develop an improved method.

### Experimental

The experimental work was carried out with bath B, a typical low-speed brass solution. Scattered tests were also made with the other baths listed in Table III. These results were similar in general trends to those for bath B but differed in magnitude; they are not presented here. As a rule, the more concentrated the brass solution the greater was the effect of such variables as temperature and dilution upon the value for free cyanide obtained by a given method.

The general titrating procedure was as follows: Ten ml of brass plating solution were transferred to a 250-ml Erlenmeyer flask, and the desired amounts of potassium iodide indicator and distilled water were added. The solution was then titrated, using vigorous agitation, with 0.1-N silver nitrate to the appearance of a bluish opalescence. The end point was best seen against a black background.

The effects of a number of variables on the value for the free cyanide were studied. They included some pertaining to the titrating method and others pertaining to the composition of the brass bath. The results are given in Fig. 2.

### Discussion of Results

*Potassium Iodide*—The potassium iodide indicator is added to improve the sharpness of the end point. The end point is difficult to see without it, and even with up to about 0.5 g it is still rather indistinct. As seen in Fig. 2, the amount of potassium iodide also influences the value for free cyanide, and there is a range of potassium iodide concentrations within which minimum free-cyanide values are obtained. From these considerations, 2.5 g potassium iodide (10 ml of 25 per cent solution) was selected for the preferred method.

*Water*—Added water in this discussion includes both the water added as such to the sample and in the potassium iodide indicator solutions but not the water

TABLE IV. FREE SODIUM CYANIDE CONTENTS AS DETERMINED BY SEVEN DIFFERENT METHODS

| No. | Method | Free Sodium Cyanide, g/l, in Baths | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 1 | Guidebook | 13.9 | 16.0 | 16.2 | 17.7 |
| 2 | Pan | 11.5 | 11.9 | 12.7 | 12.1 |
| 3 | Blum and Hogaboom | 7.9 | 7.8 | 7.8 | 8.9 |
| 4 | Experimental | 10.5 | 10.3 | 10.9 | 10.1 |
| 5* | Heiman-McNabb | 11.4 | 7.8 | 10.4 | 5.3 |
| 6* | Clarke | 11.3 | 7.6 | 10.1 | 5.1 |
| 7* | Coats | 9.5 | 6.8 | 9.3 | 2.9 |
| 5a† | Heiman-McNabb | 11.3 | 3.1 | 1.9 | −6.6 |
| 6a† | Clarke | 11.3 | 3.1 | 1.9 | −6.6 |
| 7a† | Coats | 9.3 | 2.0 | 0.6 | −9.2 |

*Zinc assumed present as $NaZn(CN)_3$, copper as $Na_2Cu(CN)_3$.
†Zinc assumed present as $Na_2Zn(CN)_4$ copper as $Na_2Cu(CN)_3$.

in the silver nitrate titrating solution. It is seen in Fig. 2 that the value for the free cyanide increases considerably and in direct proportion to the increase in added water.

The end point is sharp with little added water but becomes progressively less distinct as the dilution is increased. The hazy end points and high values for free cyanide obtained in several direct-titration methods (Table IV) is partly due to the high dilutions which are used.

From the results obtained, one may conclude that the lowest possible amount of water should be added. In the experimental method 4, the only added water was that present in the potassium iodide indicator.

*Temperature*—None of the direct-titration methods in the literature require a specific temperature for the titration.

The considerable increase in the free-cyanide value with increase in titrating temperature noted in Fig. 2 makes it desirable to carry out the analysis at a definite temperature. One may consider 7° C (45° F) as giving, in this bath, free-cyanide values closest to the theoretical value obtained by calculation method 7. However, because the interference by ferrocyanides cannot be eliminated, a theoretical value cannot be obtained with shop solutions. Since cooling is not always available and it is easier to standardize a heating procedure, 30° C (86° F) was selected as being most convenient. In practice, the titration may be made at a lower temperature to or even slightly beyond the end point, after which the sample is heated to exactly 30° C with solution of the turbidity and then titrated to the new endpoint.

*Sodium Carbonate*—Sodium carbonate, present in all brass baths, is known to affect the value for free cyanide[23]. In the Blum and Hogaboom method it is removed as barium carbonate prior to the silver nitrate titration. For the study of the effect of sodium carbonate, a solution of bath-B composition but without the sodium carbonate was made. Various amounts of sodium carbonate were added, and the

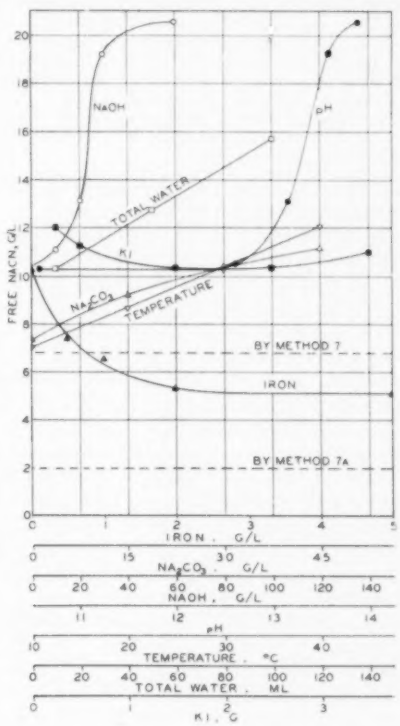


*Fig. 2. Effect of amount of potassium iodide, added water and temperature in the titration and of sodium carbonate, sodium hydroxide (pH) and iron contents of the brass plating bath on the free-cyanide values for bath B (Table III) obtained by the experimental direct-titration method*

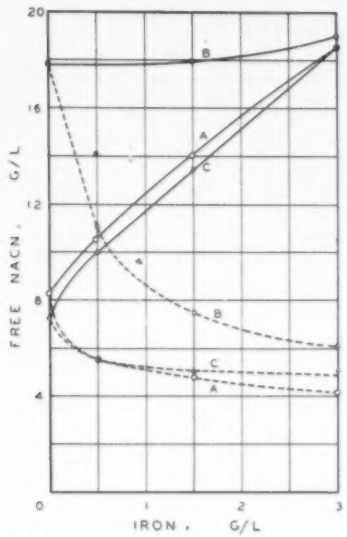


*Fig. 3. Effect of iron content of the plating bath on the free-cyanide values for (A) a carbonate-free brass bath of the same normal composition as bath B, (B) a carbonate-containing brass bath of the same nominal composition as bath B, and (C) the same bath as in B from which the carbonate had been precipitated with barium nitrate. Solid lines represent yellow endpoints; broken lines, white endpoints*

solutions were analyzed for free cyanide by the experimental direct-titration method.

It is seen in Fig. 2 that the value for free cyanide increases with increasing concentrations of sodium carbonate and that the effect is appreciable even at the lower carbonate contents. These data thus explain why the free cyanide obtained by the Blum and Hogaboom method is lower than by the other direct-titration methods. In addition, the endpoint becomes progressively more delayed and accompanied by heavy white precipitation as the carbonate content is higher. To eliminate carbonate as a variable, and to obtain a sharp endpoint, one should precipitate the carbonate from the sample prior to titration. An addition of 40 ml of a 65 g/l barium nitrate solution will precipitate an equivalent of about 105 g/l (about 14 oz/gal) sodium carbonate, which is as much as can be tolerated in the bath for good operation.

*Sodium Hydroxide (pH)*—There are two types of brass plating solutions in general use: the low-*p*H (10.3 to 10.7) and the high-*p*H (12.0 to 13.0) type.

No sodium hydroxide is added to the low-*p*H baths. Buchan[4] stated that a fresh brass bath to which no sodium hydroxide had been added has a *p*H of 10.4 electrometric and that after several months' operation the *p*H had fallen to and remained at 9.4. The low-*p*H bath is said to have the advantage of low rate of carbonate formation. The high-*p*H baths generally contain 4–11 g/l (0.5–1.5 oz/gal) sodium hydroxide.

That the free cyanide content is affected by the addition of sodium hydroxide is shown in equation 7 of Part I of this series, in which the sodium hydroxide displaces sodium cyanide from the zinc cyanide complex with formation of sodium zincate.

Various amounts of sodium hydroxide were added to samples of bath B. After each addition the electrometric *p*H was determined by a No. 7662 Leeds & Northrup *p*H meter equipped with a type 1199-30 glass electrode, and then the free cyanide content was analyzed by the experimental direct-titration method.

It will be seen by a comparison of the curves for *p*H and NaOH in Fig. 2 that in the process of raising the *p*H of the bath, two distinct ranges are encountered, of which the first is unbuffered, the second buffered. In the unbuffered range, a relatively small addition of sodium hydroxide (about 8 g/l, or 1 oz/gal) causes a large increase in *p*H (from 10.5 to 12.8). However, this increase in *p*H scarcely affects the free cyanide content as determined by direct-titration. In the buffered range, further additions of sodium hydroxide cause a very much slower increase in *p*H but a steep rise in free-cyanide content. After about 60 g/l sodium hydroxide has been added, all of the cyanide in the zinc complex (plus the original free cyanide) is titrated.

It may be concluded therefore, that the direct-titration method is satisfactory for brass baths similar to bath B up to a *p*H of 12.8.

The sharpness of the endpoint of the titration is markedly affected by the sodium hydroxide content of the brass bath. Thus, the end points were very sharp with bath B as prepared and with about 7.5 g/l (1 oz/gal) added sodium hydroxide, as well as with solutions to which 60 g/l (8 oz/gal) sodium hydroxide had been added, the endpoints with solutions containing intermediate amounts of sodium hydroxide were hazy white and slow to develop. This is probably due to the unstable zinc cyanide complex-zincate equilibrium in this region.

*Iron*—Commercial brass plating baths inevitably accumulate iron as an impurity from attack on the steel tank, ball-anode holders, etc. In small amounts, iron is not particularly harmful in the bath, and at least 3 g/l (0.4 oz/gal) may be tolerated without detriment to the brass deposit[42].

In the evaluation of the effect of iron, definite concentrations of $Na_4Fe(CN)_6 \cdot 10H_2O$ were added to samples of bath B, and the free cyanide was analyzed by the experimental direct-titration method.

The effect of iron, shown in Fig. 2, is indeed profound. The ferrocyanide reduces considerably the value for free cyanide; even a small amount, 1 g/l (1/8 oz/gal) of iron, has a large effect. Furthermore, the endpoint in baths containing iron is white, less distinct, and develops slowly. In the more concentrated bath D, a given addition of ferrocyanide had an even greater effect.

(*Continued on page 756*)

project no. 6

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*AUTHORS

# Porosity of Electrodeposited Metals

## VIII. LOSS OF WEIGHT, INCREASE OF PERMEABILITY, AND FAILURE OF ELECTRODEPOSITED COATINGS

1. *Depth and Surface Corrosion*

In previous communications of this series[1], we have shown how, since the very beginning of exposure to a corrosive medium, and at a stage where no visible changes are observable to indicate incipient and progressing corrosion, appearance and gradual increase of gas permeability are early signs of the development of the corrosive process. In a metal foil sufficiently thick to exhibit no measurable initial permeability, exposure in a corrosive atmosphere will produce, at a moment depending on the severity of the attack, measurable gas permeability, which from then on increases at a self-accelerating pace. What undoubtedly happens in this process is that attack sets in at numerous *points* scattered all over the surface and, with time, penetrates increasingly farther in depth, boring a multitude of microscopic channels across the foil. Permeability sets in once these channels have pierced the foil and their sum has reached a certain total cross section. Increase of the permeability means an increase of that total cross section, through an increase both of the number of channels and of their average diameter. It is clear that this process, producing as it does only microscopic channels, need not be accompanied by dissolution of significant amounts of metals. It is easily conceivable that the loss of weight due to that *depth* corrosion may be so small as to escape detection, even though the permeability to gases may have become very comfortably measurable.

Parallel with that process of increase of permeability, there does occur, in suitable corrosive media, a steady decrease of weight through loss of metal by dissolution. The experiments described in the following will show that this loss of weight is not related to the increase of permeability. By its very magnitude and the steadiness of its rate, it evidently is due to corrosive attack, not at points, but over the whole surface area. It removes metal, not by boring in depth along microscopic transverse channels, but layer by layer. This *surface* corrosion is evidently overwhelmingly responsible for any massive loss of weight that may be observed.

The rate of development of depth corrosion, indicated by the rate of increase of permeability, depends evidently on the nature of the metal and, with a metal of given characteristics, must be a function of its thickness. The thicker the specimen, the slower will depth corrosion and permeability develop.

This is demonstrated by Fig. 1, representing the increase of the permeability constant $k$, in liter/cm² min, of five electrolytic- and one rolled-nickel foil exposed to the vapor over a 12-*N* hydrochloric acid in a thermostat kept at 25° C. Curve 1 refers to a rolled-nickel foil of 20-micron (0.8-mil) thickness; curves 2, 3, 4, 5, and 6, to electrolytic nickel (sup-

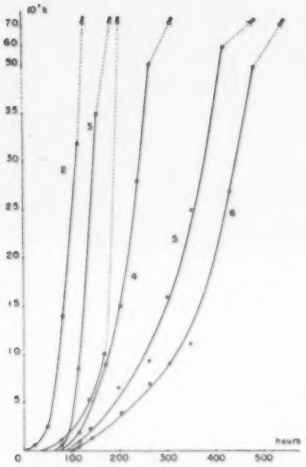


*Fig. 1. Increase in permeability constant k in liter/cm² min with time of exposure to vapors over 12-N hydrochloric acid at 25° C of (1) 20-μ rolled-nickel foil, and (2) 26-μ, (3) 51-μ, (4) 70-μ, (5) 80-μ, (6) 91-μ electrolytic-nickel foil*

plied by United Chromium, Inc.) of, respectively, 26, 51, 70, 80, and 91 microns (1, 2, 2.8, 3.2, and 3.6 mils). It is evident that, in the series of electrolytic-nickel foils, the rate of depth corrosion decreases regularly with increasing thickness. It is striking, but in full agreement with our previously reported findings, that the 20-micron (0.8-mil) thin rolled nickel foil No. 1 corrodes in depth slower than a thicker 51-micron (2-mil) electrolytic foil.

These differences disappear completely for surface corrosion. In Fig. 2, we have plotted the loss of weight, in milligrams, of the same six nickel foils in the same exposure. The six kinds of "points" (circles, squares, triangles, etc.) refer each to one of the six foils. It is evident that, from the viewpoint of rate of weight loss, the five electrolytic foils are indistinguishable, not only from each other, but also from the rolled foil. All six foils lose weight at the same rate of 0.03 mg/cm² hour. Surface corrosion knows no thickness and does not even discriminate between electrolytic and rolled nickel.

### 2. *Ultimate Failure*

At the end of prolonged exposure, of a length depending on the severity of the corrosive medium, a foil "fails", i. e., becomes visibly perforated. Evidently, at this point, and even some time before that ultimate "catastrophic" occurrence has been reached, determinations of gas permeability become pointless, because the permeability has become much too great for measurement and practically "infinite" upon gross perforation. "First visible failure" is an accepted, and reasonable, *practical* criterion of corrosion, and for practical purposes "corrodibility" conveniently can be, and often is, defined by the time elapsing, in a given corrosive medium, until the appearance of first visible failure. From the practical point of view, it is evidently the most meaningful manifestation of corrosion.

In Fig. 1, the length of time elapsed until the appearance of first visible perforation is marked for each foil by a small circle with an arrow pointing toward it. Clearly, first visible failure is but the windup of the progress of the invisible depth corrosion which has been going on ever since the beginning of the exposure and the sole manifestation of which has been the increasing gas permeability. The faster that increase, the sooner will first visible failure occur. The imminence, or remoteness, of that eventual breakdown can be safely predicted from the velocity of the increase of the permeability in exposure. This possibility of extrapolating the time of ultimate failure from the increase of permeability at relatively early stages of the exposure is of particular interest for investigations of corrodibility in only mildly corrosive surroundings, where actual ultimate failure will occur only after inordinately prolonged exposures. The increase-of-permeability method will provide the right answer in an incomparably shorter time.

The intrinsic reason for the assurance with which the permeability method is capable in predicting the more distant fate of a metal foil from its early behavior is the fact that the method measures an *average* of a very large number of micro-happenings. The permeability method is actually what one might term a *microstatistical* method giving the correct probability.

On the other hand, it is evident that loss of weight, i. e., surface corrosion, gives no indication whatsoever and is entirely uninformative as to the occurrence of visible failure.

### 3. *Corrosion through Coatings*

Further information on the mechanism of the failure of a *base* metal protected by an electrodeposited coating was gained by combined loss-of-weight, increase-of-permeability, and analytical investigation of thin iron foils coated on both sides with nickel. The iron was commercial 1-mil (25-μ) rolled shim stock. In Figs. 3 and 4, sample No. 1 was mildly etched and coated on both sides with 10 microns (0.4 mil) of regular warm-bath Watts nickel. Samples 2 and 3 had received, prior to the nickel-plating, a 2-micron (0.08-mil) coating of electrolytic iron on both sides, following a suggestion by Hothersall and Hammond[2]; over this layer, No. 2 was coated with 10 microns (0.4 mil) of nickel, No. 3 with 8 microns (abt. 0.3 mil). Samples 4, 5, and 6 corresponded, respectively, to 1, 2, and 3, with the only difference that the nickel was deposited, not from a Watts bath with soluble nickel anodes, but from a pure sulfate bath with insoluble anodes. The purpose of, and the inferences from, these variants will be made clear further on, under 4.

Fig. 3 shows the results of determinations of the rate of increase of permeability under the same conditions of exposure as before. The closeness of the pairs 1–4, 3–6, and 2–5 shows that there are no differences worth speaking of between the Watts and the pure sulfate bath. But a layer of electrolytic iron between the commercial iron sheet and the nickel coating does reduce the corrodibility very significantly; so much so that it even offsets a slight sacrifice of thickness of the nickel coating. Correspondingly, first visible failure appears in sample 3 *later* than in sample 1.

The rate of loss of weight, shown in Fig. 4, is, once more, constant throughout the exposure. While it is not quite identical for all six specimens, as it was with pure-nickel foils of different thicknesses, the variations from one sample to another are minor and are unrelated to either the rate of increase of permeability or the appearance of first visible failure. Roughly, the rate of loss of weight is, again, about 0.03 mg/cm² hour, i. e., of the same order as for pure nickel foils.

This means, of course, that, in the corrosion of a "sandwich" of nickel-plated iron, what corrodes throughout the exposure is mainly the *nickel coating*. The observed loss of weight of the "sandwich" is mainly due to *surface* corrosion of the coating. But at the same time the

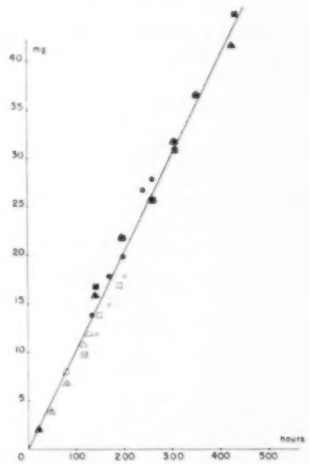


*Fig. 2. Loss in weight in milligrams with time of exposure to vapors over 12-N hydrochloric acid at 25° C of the foils described in Fig. 1*

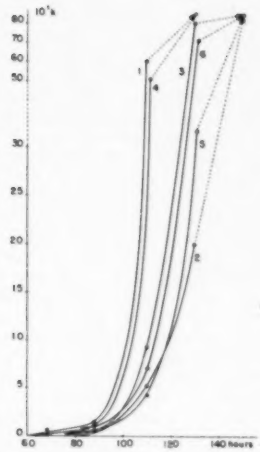


*Fig. 3. Increase of permeability constant k in liter/cm² min on exposure to vapors over 12-N hydrochloric acid at 25° C of mildly etched 1-mil rolled shim stock coated on both sides with (1) 10-μ Watts nickel, (2) 2-μ electrolytic iron plus 10-μ Watts nickel, (3) 2-μ electrolytic iron plus 8-μ Watts nickel, (4) 10-μ sulfate nickel (with insoluble anodes), (5) 2-μ electrolytic iron plus 10-μ sulfate nickel, (6) 2-μ electrolytic iron plus 8-μ sulfate nickel*

coating suffers also an increasing *depth* corrosion which eventually results in its failure. At that stage, but *not any earlier*, one should expect a beginning, and increasing, massive corrosive attack on the base metal, iron.

Evidence for that was provided by analyses of the corrosion products at various stages of the exposure. Nickel was determined colorimetrically by the dimethylglyoxime method, iron colorimetrically by the thiocyanate method. Agreement between the analyses and the total loss of weight was satisfactory throughout. The corrosion products during the first 65 hours of exposure consisted entirely of nickel. Colorimetrically detectable traces of iron began to appear only at around 80 hours. From then on the percentage of iron in the products increased steadily but slowly, still lagging far behind the amount of nickel dissolved and attaining some 8–10 per cent of the total at the end of the exposure. The exact moment of first appearance of traces of iron cannot, of course, be fixed accurately; it certainly was present at about the 80th hour, and some of it may have begun to appear from about the 70th hour. Now, a 10-micron (0.4-mil) nickel foil alone, i. e., of the same thickness as the nickel coating of these sandwiches, showed in the same exposure *first* visible perforation after about 55 hours. At around 70–80 hours, perforations were frankly gross. The agreement is good enough to warrant the conclusion that the base iron is not attacked *unless* and *until* the protecting coating has been finally corroded to the point of visible gross holes.

When at the end of the "incubation" period of the invisible increase-of-permeability depth corrosion the coating has been grossly perforated, then, and *only* then, does massive attack of the base metal set in and develop. From this point on, the base metal, too, suffers increasing corrosion in depth, which, on account of the evident local-couple action, is even severer than it would be in the absence of a coating.

This is illustrated by an experiment of simultaneous exposure, under the same conditions as before, of an uncoated 1-mil (25-μ) rolled iron foil and of the same iron coated on both sides with 10 microns (0.4 mil) of Watts nickel. Loss of weight, in both cases, proceeded at a steady rate; the coated specimen was losing weight at the rate of 0.03 mg/cm² hour, corresponding to the loss of weight of nickel, the uncoated sample at the higher rate of 0.047 mg/cm² hour, corresponding to the more rapid attack of iron. First signs of permeability, indicating beginning depth corrosion of the base metal, appeared in the uncoated foil after 40 hours, in the coated foil only after 70 hours. But from here on, i. e., from the point where the coating was already grossly perforated, the permeability of the *coated* sample increased at a *very much higher rate* than that of the bare iron, and, correspondingly, the coated sample was already visibly perforated after 130 hours, as against the 194 hours which it took the thinner uncoated all-iron sample to reach the same point. Meanwhile, loss of weight proceeded in each specimen at its former steady rate.

### 4. *Meaning of Porosity*

This picture of the mechanism of corrosion of coatings involves a fundamental departure from older views. According to the latter, local failures are the result of discontinuities or pores which existed in the coating since the very beginning and which were large enough to be permeable to a aqueous solution. The new data support the idea of a coating structure impermeable to liquids which suffers invisible microscopic depth-corrosion. This leads to a steady increase in permeability to gases until a through channel large enough to be penetrable by liquids is completed and the base metal is finally laid bare to attack at that point.

The principal reason for discarding the old views is that there is no proof that a system of pores large enough to be permeable to liquids exists in the sound deposit free from accidental pinholes. Demonstrations of initial porosity by means of chemical spot reagents are misleading since the reagents used in such tests, if effective, have been shown to be corrosive to the coating.

There can, of course, be no quarrel with the assertion that if a gross pore permeable to liquids is present in the coating at the beginning corrosive attack will occur at that point at a very early stage. But there is no good reason to attribute local failures occurring at the end of long exposures to hypothetical initial pores in the coating. On the contrary, there is good reason to believe that pores in the coating develop as a result of its slow and gradual local corrosion.

A good illustration of the contrast between the old and the new point of view is provided by the case of the Hothersall and Hammond "porefree" nickel, mentioned above under 3. These authors produced (a) a regular nickel deposit on a commercial iron surface, (b) a nickel deposit from a pure sulfate bath, with insoluble anodes, over a thin layer of electrolytic iron deposited on the commercial iron. In a "hot water test" arbitrarily limited to a few hours, specimen (a) showed rust spots, whereas specimen (b) remained spotless. The observations are correct. But the interpretation and the conclusion that, whereas in (a) the nickel deposit was initially "porous", it was "porefree" in (b), are unwarranted.

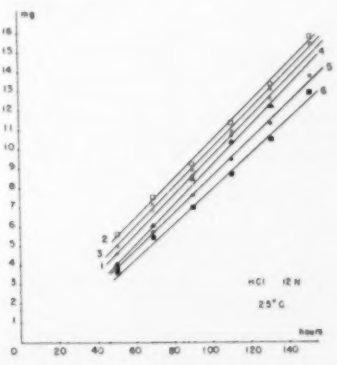


*Fig. 4. Loss in weight in milligrams with time of exposure to vapors over 12-N hydrochloric acid at 25° C of the "sandwiches" described in Fig. 3*

Specimen (b), too, shows spots if the exposure is prolonged sufficiently. There is no basis for the assumption that hot water if it is applied only for six hours is merely a harmless "porosity reagent" and that it suddenly becomes a corrodent on longer applications. The truth is that hot water has been a corrodent since the very beginning of the exposure. And the observations of Hothersall and Hammond mean solely, and simply, that the deposit produced under the conditions (b) is *less rapidly corrodible* than the one produced under conditions (a). This we have amply demonstrated under 3; at the same time, we have been able to prove that the main element of the lesser corrodibility of the nickel coating (b) is the electrolytic-iron layer, not the use of the pure sulfate bath or insoluble anodes.

Porosity of electrodeposits in terms of incidence of local failures on exposure means, in the light of facts, formation of pores large enough to permit passage of corrosive solutions through the coating as the final result of a nonuniform corrosion process.

### 5. *Effect of the Base Surface Condition*

The fact that a nickel deposit produced by the procedure of Hothersall and Hammond is actually more resistant to corrosion than a deposit of the same thickness produced directly on commercial iron without an intervening layer of electrolytic iron, is closely related to our previously reported observations of the variability of the initial permeability, and of the corrodibility on exposure, of deposits produced on different base-metal surfaces. In particular, it will be recalled that nickel deposits on a *crystalline* base surface show lower gas permeability when thin and slower corrodibility at greater thicknesses. The uniform crystallinity of the electrolytic-iron surface, as compared with the distorted, partly flowed condition of the rolled-iron surface, is one obvious factor which determines the superiority of the "Hothersall-Hammond" nickel towards corrosion. The chemical purity of the electrolytic iron, as contrasted with the inclusions present in commercial iron, may be another. Other significant factors which are involved in the strong variations of the corrosion resistance of a given coating and which depend on the characteristics of the base metal will be dealt with in following communications.

### 6. *Heterogeneity and Overall Corrodibility of Electrodeposits*

It immediately becomes understandable why, when failure finally occurs in the coating, it happens just at a given spot and not elsewhere. In terms of the older conceptions, this was taken to mean that there has been a "pore" at that point all along, hence that failure would not have occurred if the "porosity" had been avoided to begin with. This, of course, is conjecture. To us, failure at a given spot merely indicates, in the way of an obvious prophesy from the event, that the coating *must* have been less corrosion-resistant at the spot where the failure has occurred. It means, in other words, that different areas of the deposit are of *uneven quality*, or heterogeneous; if so, there always *must be* areas less resistant than others; in these areas, permeability must have been increasing more rapidly than elsewhere and failure reached correspondingly earlier.

Among the factors which are responsible for this *obligatory* unevenness of the corrosion resistance of *any* coating, first and foremost is the unavoidable heterogeneity of the surface of any commercial metal. The corrosion-resistance characteristics of a given area of the deposit are largely dictated by local characteristics of the base metal; heterogeneity of the base inevitably produces heterogeneity of the deposit, and uneven distribution of corrodibility. However, apart from the matter of heterogeneity and unevenness, the fact remains that certain coatings and combinations of coatings are, *as a whole* and *as a matter of average quality*, more subject to depth *corrosion* and hence to earlier failure than others. The old "porosity" doctrine is evidently powerless to account for such variations, as there is no earthly reason why, in particular, certain combinations of coatings should have a greater or smaller initial "porosity". There can, however, be logical and factual reasons for differences in overall depth-corrodibility.

In the light of these conclusions, the task of further research on what we have recognized to be porosity in its *real* and *actual* sense is to determine the exact relations between the corrosion resistance of a coating and specific characteristics of the base metal, its relation with the conditions of the deposition and with combinations of coatings. Further communications in this series will attempt to provide answers to such specific questions.


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# IX. THE EFFECT OF CERTAIN AROMATIC POLYSULFONATES ON THE PERMEABILITY AND CORRODIBILITY OF ELECTRODEPOSITED NICKEL FOILS*

In further exploration of the effects of various factors on the permeability of electrodeposits, we have compared nickel foils produced in standard Watts baths, at *p*H 2.8, 60° C (140° F), 4 amp/dm² (3.7 asf), without and with the addition of certain aromatic sulfonic acids. These were:

(I) Nickel salt of metabenzene-disulfonic acid

(II) Sodium salt of naphthalene-1, 5-disulfonic acid

TABLE I. INITIAL PERMEABILITY OF NICKEL DEPOSITS

| Thickness | | Permeability constant *k* | |
|---|---|---|---|
| microns | mil | Watts nickel | Brightened nickel I |
| 5.0 | 0.2 | $1.5 \times 10^{-3}$ | $9 \times 10^{-4}$ |
| 7.5 | 0.3 | $1.7 \times 10^{-4}$ | $5 \times 10^{-4}$ |
| 10.0 | 0.4 | $1.2 \times 10^{-6}$ | $2.6 \times 10^{-6}$ |


*Received by the Research Directing Subcommittee on November 16, 1949.

TABLE II. CHANGE IN PERMEABILITY ON EXPOSURE TO AIR SATURATED WITH VAPOR OF 12-*N* HYDROCHLORIC ACID

| Watts Nickel | | Nickel Brightened with | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | I | | II | | III | | IV | |
| hours | $k$ | hours | $k$ | hours | $k$ | hours | $k$ | hours | $k$ |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | $1 \times 10^{-7}$ | 20 | $5 \times 10^{-7}$ | 20 | $2 \times 10^{-7}$ | 12.5 | $1.8 \times 10^{-6}$ | 20 | $2.9 \times 10^{-6}$ |
| 42 | $8 \times 10^{-7}$ | 40 | $1.0 \times 10^{-6}$ | 47 | $1.5 \times 10^{-6}$ | 40 | $1.2 \times 10^{-5}$ | 42 | $1.4 \times 10^{-5}$ |
| 85 | $4.8 \times 10^{-6}$ | 84.5 | $1.4 \times 10^{-5}$ | 72 | $5.0 \times 10^{-6}$ | 87 | $9.0 \times 10^{-5}$ | 62 | $5.0 \times 10^{-5}$ |
| 100 | $2.0 \times 10^{-5}$ | 100 | $5.0 \times 10^{-6}$ | 100 | $2.6 \times 10^{-5}$ | 100 | $1.2 \times 10^{-4}$ | 92 | $2.1 \times 10^{-4}$ |

(III) 1-naphthylamine-4, 8-disulfonic acid

(IV) 1-naphthylamine-3, 6, 8-trisulfonic acid

The amounts incorporated into the solution were the smallest amounts sufficient to produce highly brightened deposits. To this end, it proved necessary to add to one liter of Watts bath 10 grams of I, or 1 gram of II, III, or IV.

Initial permeability was investigated by comparing equal thicknesses of plain Watts nickel and of nickel brightened with I. The corresponding values of the permeability constant $k$, in liter/cm²·min are given in Table I.

Clearly, the nickel deposit brightened by I has, at all thicknesses, the higher permeability. It stood to reason to expect that nickel foils brightened by the addition of any of the aromatic sulfo derivatives at our disposal would exhibit a faster corrodibility than regular Watts nickel.

The tests were conducted in a drastically corrosive atmosphere, air saturated with the vapor of 12-*N* hydrochloric acid. This atmosphere was chosen simply in order to get quicker results. By all our previous experience, this atmosphere does *not* reverse the order of corrodibilities found, over much more prolonged periods of time, in exposures to considerably milder corrosive surroundings. The results are summarized in Table II, which gives the values of $k$ after the stated times of exposure for nickel foils of 40-micron (1.6-mil) thickness produced under identical conditions from the Watts bath without and with the above-stated additions of brightening agents I, II, III, and IV.

The same results are presented graphically in Fig. 1.

All the four addition agents tested clearly increase the corrodibility of nickel, as could be anticipated from the difference of the initial permeabilities of thinner foils. The rate of corrosion increases in the order II, I, III, IV; nickel brightened with II is only slightly more corrodible than dull Watts nickel, but the amino derivatives III and IV increase the corrodibility enormously.

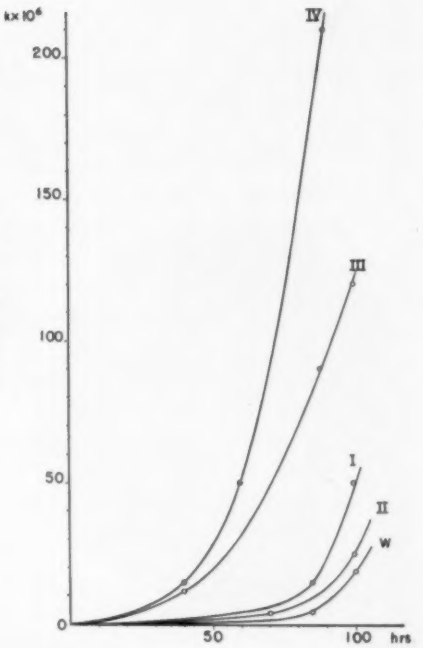


*Fig. 1. Effect of exposure to air saturated with vapors of 12-N hydrochloric acid on change in permeability constant k in liter/cm²·min for 40-micron (1.6-mil) nickel foils from Watts bath without (W) and with certain aromatic sulfonic acids (I–IV)*

At the end of the 100 hours, testing period, neither the Watts nickel nor the samples I, II and III showed any visible perforations, but the brightened-nickel samples had lost their luster. The very highly corrodible IV showed a very few visible tiny perforations. It demonstrates once more that the rate-of-corrosion curves obtained by the gas-permeability method permit an extrapolation to the conventional "corrodibility" as defined commonly by the shortness of the time necessary for the appearance of first visible failure.

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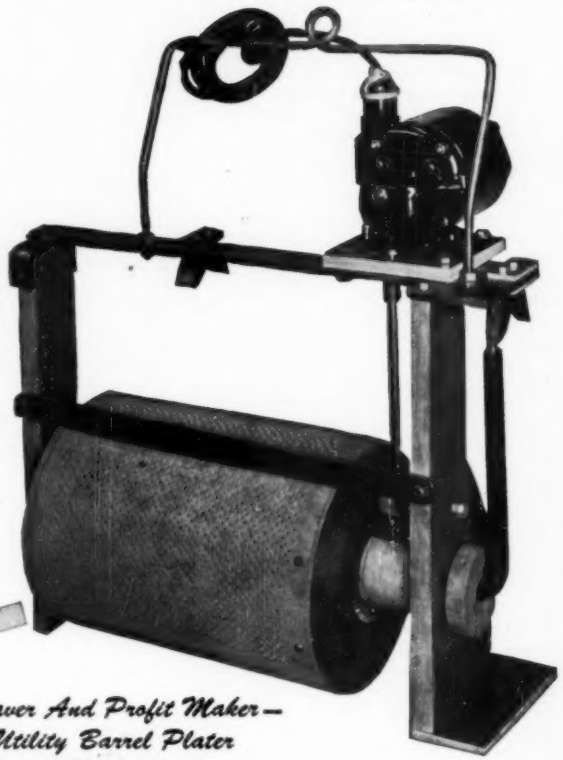

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# QUESTION BOX

## readers' questions of general interest

*Q. 87. Can you obtain for us more explicit information concerning the processing of a large bottle cap similar to that described in the Narcus article, "Plating on Plastics", which appeared in your April issue? A highly polished gold plated finish is desired.*

*A.* Our plant has turned out countless thousands of bottle caps, principally for perfume manufacturers. They are usually phenolic and supplied without liners. For sake of economy, the usual procedure after the conductive coating has been applied is to barrel-copper plate and ball-burnish them, after which gold is deposited, also by barrel. If the cap is too large, over one inch, or of improper shape, barrel plating may not be advisable and the part is racked and tank plated. This method, however, is much more costly.—R. H. KNOPF.

*Q. 88. We have a request from one of our customers to bright-zinc plate S.A.E. 1010 carbon steel and plate bright decorative chromium directly over the zinc plate. He claims that this coating will stand up better for his particular application than copper-nickel-chromium which he is using at present. We have tried it but obtain only milky plate. Can you tell how this is done and if there are any merits to this type of coating?*

*A.* None whom we have asked knows of any method of plating chromium directly over zinc and producing a bright plate. The milky plate is undoubtedly caused by the high rate with which zinc dissolves in the chromium plating solution, making it impossible to maintain a normal bright-plating range. Fairly heavy coatings of chromium have been plated directly over zinc, and the color of the chromium plate has been brought up by buffing.—K. G. SODERBERG.

### Correction

*Q. 74.* In the April issue it was stated erroneously that Costa in his article, "Regeneration of Chromic Acid Solutions by Cation Exchange", had written only about purification of plating solutions. Actually he tested his ion-exchange process on a plating bath, a copper-stripping bath, and anodizing baths and obtained good results with all.—EDITOR.


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## Nickel Immersion Coatings

(*Continued from page 734*)

and where the high hardness of the nickel deposit is very desirable. The fact that phosphorus-nickel can be hardened by heat treatment to a Knoop hardness as high as 800 suggests other applications. Here, however, the embrittlement of high-phosphorus nickel in welding must be borne in mind.

### Conclusions

The conclusions of this brief review of the two nonelectrolytic nickel-coating processes can best be presented in the form of a summary of the relative advantages and limitations of each with reference to normal nickel plating:

1. These processes do not require generators, rectifiers, control panels, or racks. The displacement method does require equipment for high temperature annealing in a nonoxidizing atmosphere.

2. The displacement process can be used to produce only thin nickel or nickel-iron coatings less than 50 millionths inch (1.25 $\mu$) thick on a steel or iron base; hence it is not useful for decorative plating.

3. The nickelized steel produced by the displacement process is suggested as an inexpensive superior base for other coatings, such as ceramic enamels, organic finishes, conversion coatings and perhaps other metallic coatings.

4. The electroless process can be used to apply coatings as thick as several mils to a variety of bases, including steel, copper, brass, aluminum, and nickel. Due to the costliness of the reducing agent, sodium hypophosphite, and the rather low efficiency of its use, electroless coatings can compete with electroplated nickel only for special purposes, such as plating inside objects large or small, coating without the aid of plating equipment, or for depositing a surface layer hardenable by heat treatment.

5. The electroless nickel deposit is not pure nickel but contains phosphides which may prove to be an advantage or disadvantage depending upon the proposed use. Large amounts of phosphide in nickel may alter its corrosion resistance although the behavior in salt-spray and ferroxyl tests is normal. With high phosphorus content nickel is nonmagnetic, which property may be useful in special cases.

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## Free Cyanide and Ammonia

(*Continued from page 748*)

The early endpoints produced by ferrocyanide in a brass bath are probably caused by the slow formation of the insoluble white salt $Na_4Zn_3(Fe(CN)_6)_2$ [4,37]. This salt, which is not usually believed to form in baths containing common amounts of free sodium cyanide, does form as the titration approaches the endpoint and the free cyanide has been reduced to a low value. It may also be in the slowly appearing sludge discussed by Graham[44].

An attempt was made, with a newly prepared brass bath of the same nominal composition as bath B, to continue titration past the white endpoints and obtain normal yellow endpoints. The results are shown in Fig. 3. Curves A are for a bath without carbonate, curves B for a bath with 30 g/l (4 oz/gal) sodium carbonate as in the regular bath B, and curves C for the carbonate-containing bath after the carbonate had been removed from the bath sample by precipitation with a 50 g/l barium nitrate solution and filtration through Whatman No. 42 filter paper (ordinary filter paper will not retain the precipitate).

The yellow endpoints (solid lines) were in all cases so obscured by the white precipitate that they reproduced poorly. The white endpoints (broken lines), however, reproduced quite well, within a couple of tenths of a gram per liter.

The interference of sodium carbonate is seen to be profound, and the need for removing it is again strongly indicated.

Of special interest is the shape of the broken-line curves A and C in the presence of more than 1 g/l iron. The almost constant values for free cyanide at the higher iron contents suggest that the addition of potassium ferrocyanide would eliminate iron as a variable.

The relatively poor reproducibility commonly encountered in the free cyanide analyses of commercial baths are no doubt partly due to the interference of ferrocyanides in all direct-titration methods.

(*To be continued*)

### FINISHING MEN'S JEWELRY AND HABERDASHERY HARDWARE

#### A Correction

Mr. James E. Weaver of Weaver Equipment & Supply Company, Temple, Texas, formerly with Hickok Manufacturing Company and responsible for the preparation of the picture story on this subject in the May issue, writes:

"I noticed one error in the article. We did not use the Protectox treatment for silver plate, all of which was lacquered. The Protectox treatment was used as a dip to protect brass before lacquering and on gold plated or gold filled articles that were notlac quered."

We regret this error.

# Book Review

DR. HAROLD J. READ
*Associate Professor of Metallurgy, Pennsylvania State College*

PAINT AND VARNISH TECHNOLOGY edited by William von Fischer, 1948, vii + 509 pages. Reinhold Publishing Corporation, 330 W. 42nd Street, New York, N. Y. Price, $8.00.

The field of paint and varnish technology is an immense conglomeration of ancient art and modern developments, of hit-or-miss mixtures and exactly compounded formulae, of use based on prejudice and use based on well-conducted tests. Add to this the myriad ingredients that can be put into paints, varnishes, enamels, lacquers, and other coatings of this type; mix well with the manifold environments which the coatings may be expected to withstand; and one will have some idea of the problems involved in compiling a text which will cover the field in a reasonable number of pages. The editor and thirty-three contributing authors have succeeded very well in accomplishing this formidable task.

The early chapters of the book are devoted to the properties, origins or syntheses, and to some extent the interrelations of the basic ingredients such as drying oils, pigments, resins, driers, etc. With this background available, the latter portion of the book is concerned with the manufacture of protective coatings. In so far as possible, the text is concerned only with principles rather than the detailed operations involved in manufacture. The testing of ingredients and finished products is treated briefly but adequately, and there is some material on manufacturing equipment as well as the technique of applying the products to various surfaces. In spite of the large number of authors who contributed the various chapters, there is little overlapping, and all of the material has been well integrated by the editor into a very readable text.

As a guide to the literature the book is rather variable. Some chapters have many references, others none or but a few. From the mechanical standpoint, the book is also a bit unattractive. Various styles for representing structural chemical formulae are used in the different chapters, and here and there carelessness in setting and proofreading the formulae is evident, e. g., pp. 186, 187 and 219.

A thorough knowledge of practical organic chemistry will be required in order to derive maximum benefits from the book, but much of it may be understood with an elementary background in this branch of chemistry. On the whole, the book is highly recommended for those who are seeking an introduction to the field, and one suspects that those already more or less familiar with the subject will find much of interest in it.

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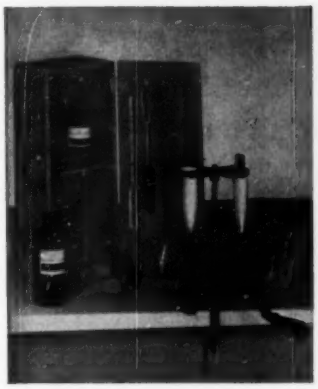

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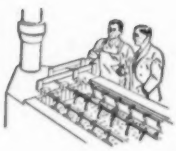

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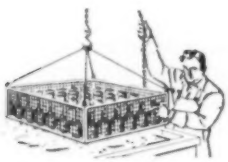

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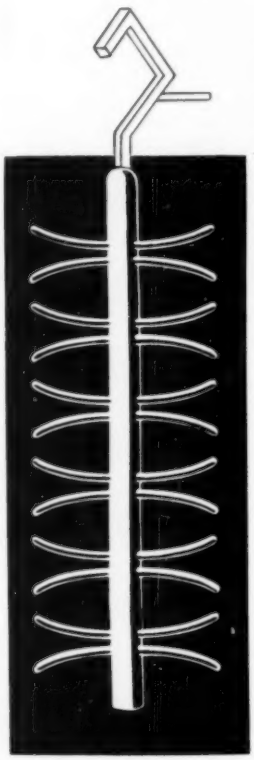

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# *Article Abstracts*

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**Change in Structure of Rolled Zinc Resulting from Mechanical and Electrolytic Polishing.** Kyoichi Ikemura. Nippon Kinsoku Gakkai-Si **13,** 27–29 (March, 1949).
Effects of the above were determined by X-ray diffraction. Patterns are illustrated.

**Application of Jacquet's Method for Electropolishing of German Silver.** M. Giroudot. Rev. metallurgie **46,** 383–386 (June, 1949).
Includes chemical composition of electrolyte and optimum operating conditions for the polishing of German silver containing 10 per cent and higher nickel contents and additions of lead dispersed in the solid solution.

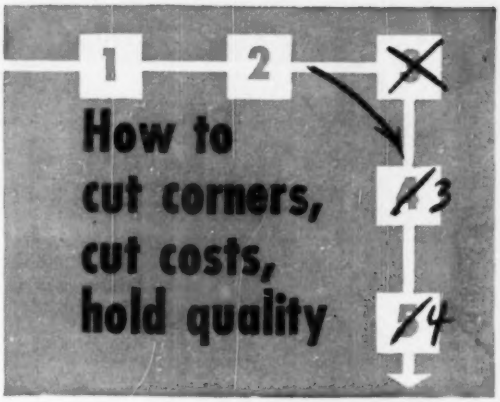
**Electrochemical Behavior of Zinc and Steel in Aqueous Media.** R. B. Hoxeng and C. F. Prutton. Corrosion **5,** 330–338 (October, 1949).
Presents progress report of an investigation of failure of galvanized pipe to determine the effect of electrolyte composition and temperature on the electrochemical relationship between zinc and steel in natural and industrial waters. Results show that electrolyte composition is of even more importance than temperature. Data are plotted. 14 ref.

**A Comparison of Some Metals for Use in Acid Pickling Baskets.** E. E. Halls. Sheet Metal Inds. **26,** 2127–2130, 2136 (October, 1949).
Experimental results for a series of common metals and alloys in several types of pickling solutions are tabulated, charted, and discussed.

**Surface Treatmen: and Finishing of Light Metals: Part 4. Chemical Cleaning and Pretreatment Processes.** S. Wernick and R. Pinner. Sheet Metal Inds. **26,** 1953–1959 (September, 1949).
A review. 128 ref.

**Porosity and Formation Rate of Electrophosphate Films.** W. Machu. Arch. Metallkunde **3,** 278–281 (August, 1949).
Proves that a-c treatment accelerates the bonderizing action even in baths which already contain powerful accelerators. The slightly greater porosity of electrophosphate films is explained, and it is suggested that such films may have a greater protective effect than other types. Data are graphed and tabulated. 14 ref.

**Manganese Phosphate Films from the "Short-Time" Bath.** W. Machu. Arch. Metallkunde **3,** 283–286 (August, 1949).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**A New Determination of Solution Potential of Electropolished Aluminum in Absence of Oxygen.** Georges Chaudron, Paul Lacombe, and Georges Youssov. Compt. rend. **229,** 201–203 (July 18, 1949). Electrolytic solution potential was determined in 3 per cent sodium chloride solution in the absence of oxygen (nitrogen atmosphere). Apparatus and procedure are described and diagrammed. Results are charted and discussed.

**The Electrodeposition of Molybdenum Alloys.** H. J. Seim and M. L. Holt. J. Electrochem. Soc. **96,** 205–213 (October, 1949).
Describes new aqueous citrate plating bath for electrodeposition of alloys of molybdenum with cobalt, iron, or nickel. Experimental results show effect of bath pH, concentration of sodium molybdate, and cathode current density on performance. 19 ref.

**A High-Efficiency Anode for Alkaline Tin-Plating. The Effect of Alloying Constituents on the Anodic Behavior of Tin in Alkaline Stannate Solutions.** Frederick A. Lowenheim. J. Electrochem. Soc. **96,** 214–225 (October, 1949).
By incorporating up to about 1 per cent aluminum in the tin anodes used in alkaline tin plating, current densities obtainable can be markedly increased. The effect of 26 elements upon the anode behavior of tin in alkaline solutions was studied. Many have little effect; some, such as nickel, silver, cadmium, and indium have a strong passivating action. 10 ref.

**Anodizing of Aluminum Wire and Strip.** N. D. Pullen. Electroplating and Metal Finishing **3,** 3–8 (September, 1949).
Problems involved in the treatment of continuous lengths and principles underlying the design of commercial plant are discussed with particular reference to domestic as well as electrical applications.

**Hydrofluoric Acid Versus Construction Materials. Part III.** (Concluded.) Chem. Eng. **50,** 227–228, 230, 232, 234, 236, 238 (October, 1949).
Includes the following sections: "Lead", Kempton H. Roll; "Silicones", J. A. McHard and A. F. Kolb; "Nickel, Nickel Alloys", W. Z. Friend; "Durimet-20", Walter A. Luce; "Rubber-Lined", C. L. Lockman; and "Protective Coatings", Kenneth Tator. Not recommended are chemical stoneware (F. E. Herstein), tantalum (Allan L. Percy), glass-lined steel (S. W. McCann), and aluminum (Ellis D. Verink, Jr.).

# Patent Abstracts

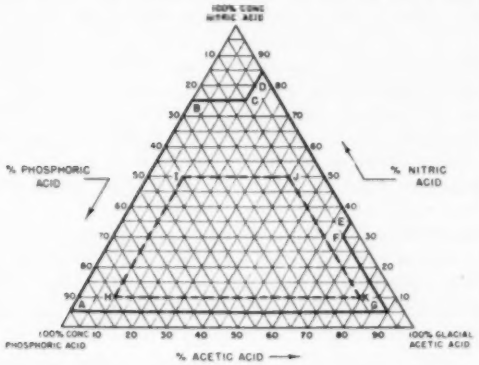
GEORGE B. HOGABOOM

*Consultant, New Britain, Conn.*

**Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.**

*No. 2,446,060, July 27, 1948—Chemical Polishing of Metal Surfaces—H. A. H. Pray, Iver Igelsrud, and G. L. Simard, assignors to Battelle Development Corporation.*

CLAIM 5. A bath for chemically polishing of metal, which consists essentially of nitric acid having a specific gravity of about 1.42, acetic acid having a specific gravity of about 1.05, phosphoric acid having a specific gravity of about 1.7, and water in an amount up to 10 per cent of the total volume of the bath, the above named acids being present in the relative percentages by volume lying within the area defined approximately in the accompanying diagram by the solid lines AB, BC, DE, EF, FG, and GA.




8 claims, 1 figure, 16 examples.

*References cited:* U. S. Patents 1,816,837; 1,919,624; 1,939,241; 2,070,487; 2,172,171; 2,238,778. British Patents 174,489; 489,211.

*No. 2,502,495, April 4, 1950—Apparatus for Copper Plating—H. Waterman, assignor to Norris Stamping & Manufacturing Company, Los Angeles, Calif.*

CLAIM 3. An apparatus for electroplating copper on the bottom corner surfaces of a stainless-steel cooking utensil which is cylindrical with a flat bottom having rounded bottom corner surface comprising an electrolyte-containable plating cell open at the top and having an inside diameter at least as great as its depth and greater than the outside diameter of the utensil to be plated, said cell having a dielectric side wall and a bottom, the entire upper surface of the bottom being anodic and consisting of a material electrically conductive and chemically resistant to the electrolyte employed, an electrolyte supply pipe disposed vertically through the bottom of said cell at the center

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thereof and having a discharge terminal in said cell adjacent the bottom thereof adapted to permit passage of electrolyte vertically upward therefrom, means to supply electrolyte through said pipe to said cell at a constant velocity, means to receive electrolyte overflowing the top of said cell, electrical connecting means for conducting plating current to said anodic cell bottom, said cell bottom being adapted to support in conductive relation a supply of anodic plating copper, electrical conducting means adapted to suspend the cooking utensil to be plated stationary concentrically with respect to said discharge terminal and to a depth below the top of said cell side wall whereby plating will occur to the desired height up the side wall of the utensil, and an annular dielectric guard ring in the upper portion of said cell extending inwardly from an in substantially fluid-tight engagement with said side wall and having a central opening less than the diameter of the flat bottom of the utensil to be plated adapted to prevent upward flow of electrolyte outwardly along the bottom of said utensil to be plated and to cause the path of travel of plating current from the anodic cell bottom to the corners of said utensil to be longer than the travel of said current to the flat bottom of the utensil.

3 claims, 5 figures.

*References cited:* U. S. Patents 519,595; 1,144,680; 1,387,425; 1,543,861; 1,594,509; 1,603,951; 1,757,235; 1,991,678; 2,044,415; 2,122,876; 2,363,973. British Patents 21,283; 312,600. Australian Patent 117,302.

*No. 2,503,863, April 11, 1950—Apparatus for Electroplating the Inside of Pipes—S. G. Bart.*

CLAIM 7. In an electrolytic cell for electroplating bores of pipes when rotating about their own axes and horizontally disposed, the combination of a pipe to be plated forming the cathode element of the cell, a hollow anode construction of squirrel-cage type located in the bore of the pipe of materially less external diameter than the internal diameter of the pipe and rotatable about an axis offset from the axis of rotation of the pipe, means for mounting the pipe with its axis of rotation fixed in space, said anode construction including end members of insulating material for insulating the anode construction from the pipe, a plurality of anode rods having their ends carried by end members and the balance of the rods being exposed to the pipe and to the electrolyte of the cell, and means for rotating the cathode element and the anode element, said means including a drive shaft directly engaging one of the end members in axial prolongation of the same to turn the squirrel-cage anode construction about its own axis.

8 claims, 5 figures.

*References cited:* U. S. Patents 586,841; 615,940; 635,380; 695,635; 908,937; 930,902; 1,057,797; 1,319,928; 1,435,671; 1,594,509; 1,609,357; 1,733,404; 1,836,579;

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1,850,426; 1,927,162; 1,953,955; 2,186,657; 2,204,756; 2,206,908. British Patents 18,643; 312,600; 400,510. French Patent 392,656.

*No. 2,505,228, April 25, 1950—Silver Cleaning Device—B. L. Chase.*

CLAIM. In a device for removing tarnish from silverware, the combination comprising a vessel containing an electrolytic solution, a pair of relatively parallel, horizontal disc electrodes submerged in the electrolytic solution in said vessel, the upper of said electrodes being perforated and adapted to support said silverware, an annular spacing member of insulating material interposed between said electrodes adjacent the perimeter thereof to preclude entrance therebetween of articles of silverware, an electrode lead in hinged sections attached to each of said electrodes and adapted to be folded inoperatively onto the said upper electrode, and means for circulating low-voltage electrical current through said electrodes and said electrolytic solution.

*References cited:* U. S. Patents 564,877; 741,690; 1,068,388. French Patent 528,006.

*No. 2,506,164, May 2, 1950—Method for the Production of Metallic Printing Members—J. E. Morse.*

CLAIM 1. In the production of metallic printing members presenting an aluminum surface partially covered in areas of predetermined outline with an integrally deposited coating of metal selected from the group consisting of copper and nickel, the steps comprising covering said surface with a masking coating containing openings having said predetermined outline within which areas of said aluminum surface having said predetermined outline are exposed, etching said aluminum surface of said exposed areas . . . with an aqueous etching solution, which comprises an anion of a strong mineral acid to remove thereby aluminum oxide from said areas and to render said areas receptive to electroplating with said metal selected from the group consisting of copper and nickel, removing said masking coating leaving both the etched areas and unetched portions of said aluminum surface exposed, and while said etched areas and said unetched areas of said aluminum surface are unprotected, electrolytically depositing said metal selectively only on said etched areas of predetermined outline as an integral firmly adherent coating by electroplating from an acidic aqueous solution of a salt selected from the group consisting of cupric salts and nickel salts.

7 claims.

LEGEND. The proportions of the etching solution can be varied considerably, and for 1000 ml of a 40° Bé calcium chloride solution the amount of cuprous chloride can be varied between about 2 and 100 grams while the hydrochloric acid can be varied between 2 and about 20 ml.

NOTE: Other etching solutions are given.

*References cited:* U. S. Patents 1,069,856; 1,151,459; 1,954,744; 2,142,564.


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G. B. BOWMAN, Chief Chemist
Subject:
*The Corronizing Process for Metallic Protection* (with lantern slides)

STANDARD-THOMSON CORP. (c)
216 S. Main St., Dayton 2, Ohio—Midwest
LEROY A. CRITCHFIELD, Chief Chemist
Subject:
*Quality Control in the Plating Department*

FREDERIC B. STEVENS, INC. (c)
Detroit, Mich.—East and Midwest
GUY CUMMINGS, Subject 1
A. H. KIRKPATRICK, Subject 2
R. L. EASTMAN, Subject 3
Subjects:
1. *Generators, Rectifiers and Electrical Equipment*
2. *Ventilation and Allied Problems*
3. *Polishing and Buffing Compositions and Their Use*

SULPHUR PRODUCTS CO., INC. (c)
Greensburg, Pa.—Any Branch
WILFRED S. MCKEON, President
Subject:
*Stripping Copper—Non-Dangerously*

TECHNIC INC. (c)
39 Snow St., Providence 3, Rhode Island—East
FRANK K. SMITH, President
DR. EDWARD A. PARKER, Technical Director
Subject:
*Gold Plating*

THE UDYLITE CORP. (c)
Detroit 11, Mich—East and Midwest
WILLIAM JACKSON, Engineer, Subject 1
JOHN DAVIS, Chief Engineer, Subject 2
GUST KENTTA, Engineer, Subject 3
DR. R. B. SALTONSTALL, Technical Director, General Topics
Subjects:
1. *Barrel Plating*
2. *Automatic Plating Equipment*
3. *Plating Room Layout*
*Also General Electroplating Topics*

UNITED-CARR FASTENER CORP. (b)
Cambridge 42, Mass.—New England
LEONARD A. CHESWORTH, Chief Chemist
Subject:
*Barrel Finishing*

UNITED CHROMIUM, INC. (c)
51 East 42nd St., New York, N. Y.—East
Waterbury 90, Conn.
DR. G. DUBPERNELL, Subjects 1 and 7
M. SHACAT, Subjects 1, 2, 3, 4 and 5
W. GAUNT, Subject 5
100 E. 42nd St., New York 17, N. Y.
H. MAHLSTEDT, Subjects 1, 2, 3, 4 and 5
R. K. GUFFIE, Subjects 2, 3, 4 and 5
F. FULFORTH, Subjects 4 and 5
E. N. RIOTTE, Subjects 4 and 5
Carteret, N. J.
D. MESERVE, Subject 6
F. L. SCOTT, Subject 6
Midwest
1700 East Nine Mile Road, Ferndale Sta., Detroit, Mich.
W. S. CIBULSKIS, Subjects 1 and 2
R. H. DUDLEY, Subjects 1, 2, 4 and 5
A. LINN, Subjects 1, 2, 3 and 4
DR. J. E. STARECK, Subjects 3 and 4
J. J. HANNEY, Subjects 2 and 3
L. M. WEISS, Subject 2
208 South La Salle St., Chicago 4, Ill.
E. M. RELITZ, Subjects 1, 4 and 5
C. W. Carter, Subjects 1, 2, 4, 5 and 6
2304 Needmore Road, Dayton, Ohio
E. W. REHME, Subjects 2 and 6
West Coast
923 E. Third St., Los Angeles 13, Cal.
R. J. WOOLEY, Subjects 1, 2, 4, 5 and 6
Canada
United Chromium Ltd., 15 Emily St., Toronto, Ontario, Canada
JAMES GUFFIE, Subjects 1, 2, 4, 5 and 6
Subjects:
1. *Chromium Plating*
2. *Copper Plating from Pyrophosphate Baths*
3. *Electrocolor and Patternplate*
4. *Anozinc and Dip Conversion Coatings for Zinc*
5. *Rack Coatings and Plating Stop-Offs*
6. *Organic Finishes and Protective Coatings*
7. *Plating Literature*

THE UNITED STATES STONEWARE COMPANY (c)
60 East 42nd St., New York 17, N. Y.—Any Branch
S. A. LEWIS, Process Equipment Division
Subject:
*Corrosion-Resistant Materials Available to the Electroplater*

WESTERN ELECTRIC COMPANY (c)
Hawthorne Works, Hawthorne Station, Chicago 23, Ill.—East and Midwest
A. G. RUSSELL, Department 6724, Subject 1
F. J. KOLAR, JR., Department 6634, Subject 2
Subjects:
1. *Application and Control of Nickel and Chromium Plating on Automatic Platers*
2. *Zinc Plating*

WYANDOTTE CHEMICALS CORP. (c)
Wyandotte, Mich.—East and Midwest
DR. ROY HEATH, Manager Industrial Detergents, Subject 1
JAMES HENSLEY, Section Head, Wyandotte Chemicals Research and Development Dept., Subject 2
LOWELL MCCOY, Staff Member, Wyandotte Chemicals Research and Development Dept., Subject 3
Subjects:
1. *Alkalies in Metal Cleaners*
2. *Radioactive Tracers in Metal Cleaning Research*
3. *Barrel Finishing*

# *A. E. S. News*

### Films for Branch Showing

Mr. W. J. Neill has compiled a list of films that is believed to be of interest to the Branches as an aid in planning Branch meetings. This list has been printed, and copies have been sent to the Branch Secretaries and to members of the Executive Board and Research Committee. A limited number of extra copies may be had from the Executive Secretary's Office.

The list includes, besides films of technical interest, a number dealing with management problems. Names and addresses of producers and distributors of listed and other films are also given.

### Law Committee Report 1948-1950

During 1948-1949, when Kenneth M. Huston was Chairman, the Committee received for review and passed upon the following Branch by-laws: Adelaide, Columbus, Detroit, Grand Rapids, Louisville, Melbourne, New York, Pittsburgh, Providence-Attleboro, Sydney.

In anticipation of the 1949 Convention the Committee framed for Chicago Branch a motion on annual dues, not submitted, and for Detroit Branch a motion to prorate dues and per-capita taxes of new members.

At the 1949 Convention the Committee participated in preparing the following:

For the Executive Board: a resolution offered to and accepted by Detroit Branch as a substitute for the above-described motion, that new members pay only for complete quarters. Passed by the Convention.

Also for the Board: a resolution eliminating transfer of funds with transfer of members between Branches. Presented to the Convention by Philadelphia Branch and passed.

For Boston Branch: a resolution concerning reports to the Society on transactions of the Board. Passed by the Convention.

At the Branch Secretaries' Breakfast in Milwaukee Mr. Glover offered suggestions on formulation and amendment of Branch by-laws. These were subsequently reduced to writing and published in the October, 1949 issue of PLATING.

On August 8, 1949, Manson Glover was appointed Chairman of the Committee.

Between date of the Milwaukee Convention and the present the Committee has received for review and passed upon the following Branch by-laws: Boston, Chicago, Dayton, Hartford, Philadelphia, Pittsburgh, Toledo.

Respectfully submitted,
LAW COMMITTEE, A. E. S.
MANSON GLOVER, Chairman,
Boston Branch

# Branch News

## BOSTON BRANCH

Mr. Joseph T. Sullivan, Sales Engineer of MacDermid, Inc., Waterbury, Conn., discussed general plating room helps and housekeeping at the meeting on May 4. He included in his talk, layout, drains, spray cleaning, solution heating, tank sumps, positioning of anodes, fume removal, barrel-plating cylinders, laboratory accessories, solution treatments and then concluded with a sound movie of Udylite fullautomatic plating equipment.

After the film, refreshments were served through the courtesy of the speaker and a general discussion proceeded at the same time.

It was voted to instruct the Convention Delegates of the Branch to vote for Dr. Swift for A. E. S. Third Vice-President. M. Glover reported on Convention plans.

George P. Swift,
*Secretary-Treasurer*

## BRIDGEPORT BRANCH

Forty-one members and guests were present at the regular meeting on April 14.

There was one election to membership and three new applications. One member was suspended for nonpayment of dues. The voluntary contributions to the Research Fund from the Branch for the fiscal year 1948–1950 amounted to $37.00.

William Ehrencrona, Chairman, reported that all arrangements had been made for holding the Spring Dinner-Dance at the Fairfield Inn on Saturday, May 27.

The election of officers had the following result:

*President*—Anthony J. Chenis
*First Vice-President*—Medwick J. Brassard
*Second Vice-President*—Raymond W. Goral
*Secretary-Treasurer*—Joseph G. Sterling
*Librarian*—Richard C. Barrett
*Sergeant-at-Arms*—Michael Lombard
*Board of Managers*—William Thompson, William Flaherty, William A. Ehrencrona, and Carl Schaefer

Delegates to the National Convention are: Joseph G. Sterling, William A. Ehrencrona, and Anthony J. Chenis, with Charles Temple, George J. Eckholm, and Raymond Kwasnik serving as alternates.

George Morrow, who wished to resign, was elected Honorary Member of the Branch instead, in recognition of his past services.

The apprenticeship training program for Metal Finishing, advocated by Mr. Harry Hyman of the U. S. Department of Labor, was brought up again. After considerable discussion it was pointed out that the Bridgeport Branch could not by itself sponsor the program without authority from the A. E. S. Executive Board. The Secretary was ordered to write to Mr. Hyman, to explain that the project was closed as far as the Branch was concerned.

Phil Bailin then showed a picture entitled "Copper" by the Arizona Bureau of Mines, which proved very interesting.

Joseph G. Sterling,
*Secretary-Treasurer*

## BRIDGEPORT BRANCH

Not less than seventy-five members and guests, attending the Open Meeting and Educational Session on April 28 in the Pitney-Bowes Company, Inc., Auditorium, Stamford, Conn., heard Dr. Abner Brenner of the National Bureau of Standards, Washington, D. C., discuss "The Nature of Electrodeposited Metals and Alloys". In his interesting talk Dr. Brenner stated that (1) in most cases, heat treatment will alter the physical properties of electroplated deposits; (2) dull nickel is better than bright nickel for electroforming; (3) the crystal structure of nickel deposits is important. If they are fine grained the deposit is harder and more brittle, while large grain structures are soft and ductile. This was proved by hardness and elongation tests; (4) oxygen, hydrogen, sulfur and carbon are codeposited with nickel in very small quantities. High-chloride baths have a fine grain structure and the deposit is hard; (5) the *p*H of a solution is very important in the control of plating baths; (6) chromium is hard and not ductile, although it is possible to get a soft chromium deposit which has no crystal structure and low tensile strength; (7) alloys are hard. Upon heat treatment the hardness increases. Electrodeposited alloys have laminated structures; (8) phosphorous alloys are hard as glass and have no crystal structures.

Slides were shown and many specimens of deposits were passed around for inspection, including plated specimens which had been elongated. Considerable discussion followed.

Thanks go to Pitney-Bowes Company and Larry C. Bennett and Herman C. Braun for the fine entertainment and refreshments that followed.

Joseph G. Sterling,
*Secretary-Treasurer*

## CHICAGO BRANCH

The April 14 meeting was attended by one hundred and seventy members and guests. The speaker, Dr. J. H. Monaweck of Elgin American, gave an interesting and instructive talk on the manufacture and finishing of compacts and allied products. His discussion of the numerous problems encountered in finishing of jewelry was followed by a lively question period.

A sound color movie, entitled "America's First Silver Plate", illustrated the activities in electroplating silver on flatware since 1847. A compact was presented to the lady holding the lucky number and a cigarette case to the winning gentleman.

Refreshments were served in the dining room.

Raymond F. Ledford,
*Correspondent*

## CINCINNATI BRANCH

An interesting meeting was held on April 26, when thirty members turned out at a fine dinner to welcome Dr. E. J. Stareck, Director of Research, United Chromium, Inc. After dinner, ten additional members appeared to enjoy two movies on jet aviation and television and to hear Dr. Stareck present the story of "Electrocolor and Patternplate". It was thoroughly enjoyed by all, as attested by the lively question period which followed.

The members were sorry to learn that their immediate Past President, Fred Brune, was transferring from the Branch, having accepted a new position in Marion, Ohio.

The Branch is now planning its annual June picnic; it is hoped that members of the Dayton Branch will come to the Queen City as our guests.

Charles Wise, *Secretary*

## CINCINNATI BRANCH

Twenty-seven members were present for dinner at the final meeting of the year to welcome Dr. F. A. Lowenheim, Metal & Thermit Corporation, Woodbridge N. J. Ten additional members appeared after dinner to witness two movies dealing with television and atomic energy.

President Ezra A. Blount announced that this was Past Presidents' Night with three former Presidents present. A resolution honoring Fred G. Brune's services as immediate Past President was unanimously adopted, with an ovation that Brune unfortunately was not able to witness since he has moved to Marion Ohio. Charles T. Nuzman, R. D. Miller and Ezra A. Blount will serve as Delegates to the Boston Convention and Fred L. Hintze as Alternate. The By-Laws were approved as prepared and were forwarded to the A. E. S. Law Committee for review. Carl Claybaugh presented a report on the Annual Stag Picnic which will be held on July 7 in Mt. Airy Forest with members of the Dayton Branch as our guests. A baseball game between the two Branches will be a highlight of the festivities.

Dr. Lowenheim then gave a talk about "Electroplating of Tin". He discussed both its present and its potential uses, pointed out the properties of tin-zinc alloy deposits and its advantage of low cost and being very easy to plate, and gave a history of tin plating with special emphasis on his development of the

potassium stannate bath. His talk was profusely illustrated with slides which showed the advantages and disadvantages of both acid and alkaline baths. He concluded by stressing the importance of anode reaction in stannate solutions. A short question-and-answer period followed, after which the members enjoyed a bull session as the guests of Chipman Supply Company.

CHARLES WISE,
*Secretary-Treasurer*

## COLUMBUS BRANCH

The following were elected to office at the April meeting:

*President*—WALTER DENNEY
*First Vice-President*—ED BRIDE
*Second Vice-President*—GAYLORD COOK
*Secretary-Treasurer*—NATE KOSLIN
*Librarian*—WILLIAM HESPENHEIDE
*Board of Managers*—LEON HAAS, JOHN BEACH, and WILLIAM NEILL

Delegates to the Boston Convention are: WILLIAM NEILL, WALTER DENNEY, and DR. CHARLES L. FAUST; alternates: WILLIAM SAFRANEK, NATE KOSLIN, and W. SKRILLITZ.

The officers will be installed at the May dinner meeting.

WALTER DENNEY,
*Second Vice-President*

## DAYTON BRANCH

The speaker at the regular meeting on April 14 was MR. P. S. CRANE, Vice-President, Len Manufacturing Company. His lecture, "Surface Finishing", covered the different finishing methods used and the need for standardization of these finishes by means of the Profilometer, Brush Analyzer, Fax Film, photomicrographs and the new Hirschmann method. The lecture was well supported by slides.

It was followed with a color film, "Tin Plate," as done at Wierton Steel Company.

R. M. CLINEHENS, *Secretary*

## DAYTON BRANCH

On April 21, sixty-one members and friends made a tour of Inland Manufacturing Company, Division of General Motors Corporation. The tour covered the manufacture of rubber gaskets, running boards, rubber and plastic steering wheels, brake hose, brake linings, refrigerator ice trays, and other rubber and plastic parts. Of particular interest was the brass plating section and the anodizing section.

It was a very educational trip and an evening well spent.

R. M. CLINEHENS, *Secretary*

## DETROIT BRANCH

Following a dinner meeting of its officers, the Branch held its regular meeting in the main ballroom of the Hotel Statler on April 14. About one hundred and seventy-five members attended.

The result of the election of officers for the coming year was announced as follows:

*President*—E. A. HAHN
*First Vice-President*—F. L. CLIFTON
*Second Vice-President*—H. E. HEAD
*Secretary-Treasurer*—J. GURSKI
*Librarian*—L. C. BORCHERT
*Board of Managers*—C. G. BORLET (three-year term)
*Delegates*—R. L. REDMOND and L. M. MORSE
*Alternate Delegates*—F. L. CLIFTON, W. L. PINNER, R. B. SALTONSTALL

After extending warm congratulations to the incoming president, E. A. Hahn, retiring PRESIDENT C. F. NIXON turned the gavel over to him. Sixteen new members were then introduced and welcomed into the Branch, which now totals over five hundred members.

The first speaker of the evening was MR. H. FAINT of the Industrial Filter & Pump Manufacturing Company, whose subject was "Modern Methods of Filtration". He was followed by MR. J. HOMER WINKLER of the Battelle Memorial Institute, who gave a most interesting talk on "The Application of Electrodeposition to the Printing Industry". As a tie-in with his talk, an excellent exhibit was shown through the courtesy of the Detroit Printing Industries. The meeting adjourned after light refreshments had been served.

E. A. STEEGAR, *Publicity Chairman*

## DETROIT BRANCH

The last monthly meeting until early September was held on May 5, with the new officers in charge.

Several additional names of new members were presented and they were duly introduced. F. L. CLIFTON, who retired as Branch secretary in mid-April after seven years of onerous duties, was called to the dais by retired PRESIDENT C. F. NIXON and presented with a gold plaque of appreciation and one of the latest television sets. The presentation received hearty applause.

Following screening of a color film of Salt Lake City and the Salt Lake section of Utah, supplied through the courtesy of C. E. HAUSSNER of the Chrysler Corporation, the evening's program was concluded with an address by MR. FRED CHASE of Frigidaire on "The Methods of Evaluating Cleaners".

E. A. STEEGAR, *Publicity Chairman*

## HARTFORD BRANCH

The meeting on May 15 attended by about sixty-five members and guests, centered around a program in which a panel of experts assisted the members in solving their finishing problems. The experts were C. CABIANCO, MacDermid, Inc.; RALPH MCCAHAN, duPont; A. W. LOGOZZO, Nutmeg Chrome Corporation; HENRY MAHLSTEDT, United Chromium, Inc.; GEORGE ANGRAVE, Optimus Equipment Company; HARRY SANDERS, Enthone, Inc.; EMIL BELOIN, W. D. MACDERMID COMPANY; C. F. ROBINSON, The Harshaw Chemical Company, and TED VOYDA, Apothecaries Hall Company. G. B. HOGABOOM acted as moderator.

A lively discussion took place on the following subjects: Udylite and Harshaw nickel solutions, baths for hard and decorative chromium, zinc and copper cyanide baths, degreasing, plating on aluminum, cleaners, and anodes.

The movie, "The Story of the A. E.S.", originally scheduled to be shown by A. E. S. PRESIDENT A. W. LOGOZZO, was deferred to a future meeting.

Refreshments were served through the courtesy of the MacDermid, Inc., Waterbury, Conn.

STANLEY PLATOZ, *Secretary*

## JACKSON-LANSING BRANCH

The Branch held its final meeting of the season on May 9 with a Frankenmuth-style chicken dinner at the Meadow Lark Inn near Jackson.

MR. JOHN V. DAVIS of The Udylite Corporation discussed "Full Automatic Plating Equipment", covering the advantages of this type of equipment over hand operation, such as greater efficiency, speed of operation, reduction of costs, rejects and floor space. An excellent sound movie helped show the development work that goes on behind the scenes in designing and building this type of equipment.

Retiring PRESIDENT L. M. HENDERSON thanked the members for their cooperation during the past year and asked that they do even more to help the newly elected officers in the coming season.

The meeting closed with a movie, "Arizona and Its Resources".

FRED W. STUCKENBERG,
*Publicity Chairman*

## LANCASTER BRANCH

The following officers were installed at the regular meeting in the Old Mill Inn in Lancaster, Pa., on May 12:

*President*—LEROY HAIN
*Vice-President*—EDWARD BEMILLER
*Secretary-Treasurer*—HARRY SAYLOR
*Board of Managers*—CLAY BRUBAKER, THEODORE SCHWALM, CHARLES TURNER

HARRY HOVIS, Chairman of the Branch By-Laws Committee, reported the By-Laws ready for approval. After other routine business had been disposed of, a movie, "How a Fine Watch Works", was shown. A Dutch lunch was served after the meeting.

The Branch was honored by the presence of two A. E. S. Past Presidents, FRED FULFORTH and K. M. HUSTON.

HARRY SAYLOR, *Secretary-Treasurer*

## LOS ANGELES BRANCH

The Annual Educational Session and Dinner-Dance was held on March 18 in Rodger Young Auditorium. A record attendance of three hundred and sixty-three was recorded. The Educational Session included the following speakers:

WALTER P. BEHLENDORF, Spence Electroplating Company, "The Economics of Plating"; JOHN V. DAVIS, Chief Engineer, The Udylite Corporation, Detroit, "Full-automatic Plating Equipment"; ARTHUR W. LOGOZZO, Nutmeg Chrome Corporation, Hartford, Conn., "Bright Nickel and Decorative Chromium Problems"; DR. M. M. BECKWITH, Manager, Technical Sales, The Harshaw Chemical Company, Cleveland, Ohio, "Leveling Properties of Electrodeposited Nickel".

The Branch felt especially honored by the presence of A. E. S. President Logozzo at both the Educational Sessions and the Dinner-Dance. Seventy-five beautiful doorprizes were awarded during the evening. A novelty, a waltz contest, turned out to be a huge success, with MR. and MRS. PAUL FRANKE finally selected by acclamation as the winners. At the April meeting General Chairman PETE RODGERS was given a rising vote of thanks for his splendid handling of the entire affair.

M. H. ORBAUGH, *Secretary*

## LOS ANGELES BRANCH

A regular dinner meeting was held in the Rodger Young Auditorium on May 10. Forty-six members and four guests were present. This meeting was the first under a new system of holding an officers' meeting before the regular meeting to discuss current business and formulate decisions to be recommended. Since it provides more time for the technical part of the program, it was well received by the members.

The speaker for the evening was MR. GEORGE KENT of Shepard & Kent Company, who spoke about "Control of Plating Solutions". His talk was followed with a lively discussion of stalagmometers, Hull Cell, bent cathodes, and the testing of cleaners and copper strikes.

Plans for the 1951 Los Angeles Convention were reported, and the special Los Angeles booth at the Boston Convention was described by PRESIDENT WOOLEY. One new member was received. It was decided to hold future meetings at the Rodger Young Auditorium.

GEORGE MCDONALD, *Secretary*

## LOUISVILLE BRANCH

ALBERT STEIDLE was returned to the chair as the Branch held its 1950-1951 elections on April 20. The other officers elected were as follows:

*First Vice-President*—ARTHUR OERTEL
*Second Vice-President*—E. W. ECKERLE
*Secretary-Treasurer*—G. H. HILLEBRAND, JR.
*Librarian*—STANLEY J. BEYER

*President Logozzo and Committee at Los Angeles Branch's Annual Educational Session and Dinner Dance.*

LIBRARIAN TOM ALLISON introduced DR. R. B. SALTONSTALL, Technical Director of The Udylite Corporation, who addressed the members on "Quality Electroplating". Beginning with a definition of quality, Dr. Saltonstall discussed the major factors which affect quality, such as plate thickness, plate distribution, porosity, purity, etc., in the light of their intended use in a particular environment Slides were effective in illustrating how each factor affected the quality of electroplate.

An open discussion of electroplating in general followed and had to be ended or it would have continued far into the night. Our thanks go out to Dr. Saltonstall for an excellent presentation and a wealth of authoritative information.

G. H. HILLEBRAND, JR.,
*Secretary-Treasurer*

## MONTREAL BRANCH

A regular meeting was held on May 2 with thirty-three members and guests in attendance.

LIBRARIAN PAUL JACQUES introduced MR. W. HELBIG of Darco Corporation, New York City, who gave an instructive talk about activated carbon and solution filtration. Mr. Helbig discussed the properties of carbon and explained the methods used in its preparation for use in the industry, including such processes as grinding, leaching, mineral-acid treatment, and disulfiding. He then touched on the uses of carbon and its specific application to the plating trade. The selectivity of its adsorbing action was explained in detail. A short discussion of filter control and of continuous *vs.* intermittent filtration ended the presentation. Delegates, and alternates' cards were issued.

Five new members were elected.

A trip to the Imperial Oil Company plant was discussed, and forty members are expected to attend.

WILLIAM GLOVER, *Secretary*

## NEWARK BRANCH

DR. C. A. ZAPFFE, Consultant, Baltimore, Md., spoke about "Aspects of Hydrogen in Plating" at the regular meeting on March 17. Dr. Zapffe gave a very forceful and convincing presentation, illustrated by slides, of how atomic hydrogen can penetrate steel alloys, causing structural changes internally and possibly destruction of coatings applied on the outside. The three chief sources of atomic hydrogen are pickling with acids and cathodizing in an acid or an alkaline media with or without metallic ions. Tremendous pressures are built up when this form of hydrogen combines with itself to produce molecules. The speaker demonstrated by means of graphs how many acid inhibitors materially reduce the amount of gaseous hydrogen generated on the outside of the piece of steel but at the same time introduce damaging quantities of hydrogen into the body of the metal. A curious fact is that aging of the hydrogenized specimen may increase embrittlement for several minutes before the condition reverses itself. Fortunately some acid inhibitors prevent hydrogen embrittlement if used in the right amounts. Temperature is an important factor in relieving steel of its embrittleness due to hydrogen. Numerous questions were asked of the speaker, who answered in a most amicable manner. His talk marks one of the highlights of this season's program.

HORACE SMITH, Chairman, reported for the Nominating Committee. The proposed slate was elected without opposition:

*President*—MYRON B. DIGGIN
*First Vice-President*—FRANK ENGLAND
*Second Vice-President*—ROBERT A. EHRHARDT
*Secretary-Treasurer*—GEORGE WAGNER
*Recording Secretary*—SAMUEL S. FREY
*Librarian*—ROBERT HORROCKS
*Sergeant-at-Arms*—JOHN GUMM
*Board of Managers*—HORACE SMITH,

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AND
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You send us sample of metal used. We will return finished sample together with compound for your specific requirements.

Speed up production with correct compositions.

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*Incorporated*
HAVERHILL, MASSACHUSETTS

ZACHARY IRENAS, EDWIN BOWERMAN
*Delegates*—HORACE SMITH, GEORGE WAGNER, EDWIN BOWERMAN
*Alternates*—JOHN GUMM, LOUIS DONROE, HOWARD COBB

ROY STOUT, one of our older members, installed the newly elected officers.

A committee, headed by ED BOWERMAN, was authorized to purchase a 16-mm sound-movie projector for a cost not to exceed $300.00.

At the suggestion of LOUIS DONROE, appreciation was extended to all retiring officers for their contribution to the success of the past year's activities.

A movie, "Champions of the Boxing World", was shown after the close of the business session. Attendance was fifty-one.

SAMUEL S. FREY,
*Recording Secretary*

## NEWARK BRANCH

Two important decisions were reached at the regular meeting on April 21: (1) to hold only one regular meeting each month beginning in September, on the third Friday of the month, and (2) to show motion pictures between 8:00 and 8:30 P. M. each meeting night with the newly purchased machine. Resignations of four members were accepted.

The guest speaker for the evening was MR. A. DOUTY of the American Chemical Paint Company, Ambler, Pa., who was presented by our new Librarian, ROBERT HORROCKS. His subject, "Pickling Inhibitors", was interesting and very instructive. Numerous questions were asked by the attentive audience, which Mr. Douty tried to answer to everyone's satisfaction. He was given a rising vote of thanks by the sixty-one members and visitors present.

A. E. S. THIRD VICE-PRESIDENT FRANKLYN J. MACSTOKER was present and spoke about some of the activities in the Society.

GEORGE WAGNER, *Secretary*

## PHILADELPHIA BRANCH

The regular April meeting of the Branch was held at Mosebach's Restaurant on April 28. A dinner preceded the meeting, with fifty members and guests in attendance.

The speaker was MR. WALTER H. PRYNE, International Nickel Company, who spoke about "Industrial Nickel Plating". He discussed the various phases of his subject under the general topics of: decorative coating; industrial and corrosion-resistant coatings for vats, piping, pumps, etc.; salvaging of worn or undersized parts; electroforming of fountain-pen caps, electrotypes, phonograph-record masters; plating on plastics. Specimens of the different applications of industrial nickel plating and electroforming were exhibited, and a leaflet was distributed giving compositions of eleven types of nickel solutions. Mr. Pyrne discussed the

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PAINT BONDING

***"Granodine"*** forms a zinc-iron phosphate-coating bond on sheet metal products — automobile bodies and fenders, refrigerator cabinets, etc. — for a durable, lustrous finish.

***"Lithoform"*** makes paint stick to galvanized iron and other zinc and cadmium surfaces.

***"Alodine"***, the new ACP protective coating chemical for aluminum, anchors the paint finish and protects the metal.

RUST PROOFING

***"Permadine"***, a zinc phosphate coating chemical, forms on steel an oil-adsorptive coating which bonds rust-inhibiting oils such as "Granoleum."

***"Thermoil-Granodine"***, a manganese-iron phosphate coating chemical, forms on steel a dense crystalline coating which, when oiled or painted, inhibits corrosion.

PROTECTION FOR FRICTION SURFACES

The oiled ***"Thermoil-Granodine"*** coating on pistons, piston rings, cranks, camshafts and other rubbing parts, allows safe break-in operation, eliminates metal-to-metal contact, maintains lubrication and reduces the danger of scuffing, scoring, galling, welding and tearing.

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***"Granodraw"*** forms on pickled surfaces a tightly-bound adherent, zinc-iron phosphate coating which facilitates the cold mechanical deformation of steel, improves drawing, and lengthens die life.

Write or call for more information on these products. Send for new descriptive folder on ACP Metal-Protective and Paint-Bonding Chemicals.

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INDICATE A 587.
INDICATE A 588.

functions of ingredients and operation of these solutions, as well as troubles and their correction.

Mr. Thomas M. Rodgers, Philadelphia Branch member and representative of Hanson-Van Winkle-Munning Company, gave a short talk on how to increase the efficiency of the plating room. Of particular interest was his suggestion to nickel plate the electrode rods of the nickel tanks with about 0.001 inch nickel to avoid contamination of the solution with copper due to daily cleaning of the rods. Introduction of copper into the chromium plating solution from the racks may be overcome by hot solder dipping the exposed areas of the racks.

President Heiman announced that the plating class would start in September and would consist of one night a week devoted to lecture and laboratory work.

A guest, Mr. J. Kurian, won the door prize, a set of carving knives, donated by Pennsalt. Three active members were admitted.

Wm. Marcovitch, *Secretary*

## PITTSBURGH BRANCH

The Branch held a very successful Annual Banquet on April 15 in Hotel Sheraton. The party began with cocktails at six, followed by dinner at seven. Cy Hungerford, the nationally known cartoonist of Pittsburgh Post-Gazette, provided the members, their wives, and guests with entertainment, which was followed by dancing. A portable radio was given as the door prize and was won by one of the ladies. Wallets fitted with small flashlights were given to each of the ladies as favors. A few remained, and these were sold to members. The last one was auctioned off along with Paul McCloskey's beautiful necktie. Mr. McCloskey, after some hedging, was forced to surrender his tie and then resorted to the use of a bow-tie made from crepe paper.

The committee responsible for the event was headed by John Davidson, who was ably assisted by E. B. Washburn, L. J. Schmitt, Jr., P. B. McCloskey, R. A. Woofter, R. J. Goldbach, R. E. Gueder, A. F. Kaupe, R. H. Schindler, and G. Herring.

E. J. Smith, *Secretary*

## PITTSBURGH BRANCH

The meeting on May 11 was shared with members of the Electrochemical Society. Forty members were present to witness installation of officers and to hear a fine talk by Dr. N. Thon.

The members were relieved to learn that the Annual Banquet had brought a small profit instead of the loss anticipated because of an appalling series of taxes.

The valedictory of retiring President Leo J. Schmitt was delivered in inimitable style. His industry, preparedness, enthusiasm and excellent plating background made him an excellent leader. He reported a larger treasury, a larger membership, and larger average meeting attendance. He thanked generously his committee chairmen and the members for their support. Frank Keller and William J. Hennessy, who had audited the treasurer's accounts reported them to be in handsome fettle. Congratulations to Robert Woofter, a really fine treasurer.

Samuel S. Johnston, A. E. S. immediate Past President and a member who serves his Branch well, officiated at the installation of officers. He charged each of the following officers with their duties and responsibilities:

President—E. J. Smith
*First Vice-President*—R. J. Goldbach
*Second Vice-President*—R. A. Woofter
*Librarian*—E. B. Washburn
*Secretary*—J. M. Davidson
*Treasurer*—R. H. Schindler

President Smith offered a salutatory to match the retiring president's speech. He named to the Librarian's Committee E. B. Washburn, Chairman; R. J. Goldbach, L. J. Schmitt, Jr., Dr. L. E. Lancy, J. D. Patrick, R. E. Geuder, L. C. Hinger, and J. M. Davidson.

Dr. Lancy presented Dr. N. Thon of Princeton University, Director of A. E. S. Research Project No. 6, whose subject was "The Nature and Effect of Porosity on Electrodeposits". He explained the permeability of thin electrodeposits to gases and how it is affected by the surface conditions of the base metal. Rate of corrosion can be measured by the increase in permeability during exposure. Dr. Thon's statement that bright-nickel deposits showed much greater permeability than standard nickel deposits was later tempered somewhat when he explained that subsequent deposits of chromium obviated this condition. Base-metal corrosion through pores in the de-

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posit are not due to original discontinuity, because then rust would form immediately. Instead the coating itself corrodes. Tests are currently being conducted to correlate microstatistical methods with large-scale exposure tests.

Dr. Thon's very informative and interesting talk brought out some pertinent questions and discussion.

J. M. DAVIDSON, *Secretary*

### PROVIDENCE-ATTLEBORO BRANCH

MR. DANIEL GRAY of Oneida Ltd. spoke about "Some Special Research Problems in Electroplating" at the meeting on March 20.

One of the major problems in alloy deposition is the short range of current density over which a fairly constant alloy composition will plate. In attempts to plate a nontarnishing silver-indium alloy over silverware it was found, according to Mr. Gray, that the presence of a small percentage of nickel would markedly broaden the current-density range. In the discussion which followed it was brought out that this phenomenon was fairly common with gold alloys, especially gold-copper. Brighteners for silver were discussed at some length. All silver brighteners appear to need some ageing, or probably it should be called reaction time with cyanide, to form the actual brightening agent.

The passing of JAMES KELLY of Attleboro was announced. Two new members were elected, and three applications were received.

EDWARD A. PARKER, *President*

### ROCHESTER BRANCH

ED WALLIN was acting secretary at the March meeting.

A Nominating Committee was appointed by PRESIDENT JOSEPH W. HULL as follows: R. FLINT, Chairman; E. M. WALLIN, J. Q. ADAMS, and W. C. TREADWELL.

J. E. WEAVER, who is leaving the Rochester Branch shortly, commented on how much he had enjoyed working in the Rochester Branch. A rising vote of thanks was extended him for his efforts as a member and an officer in behalf of the Branch.

The following delegates to the Boston Convention were elected: E. DEWITT, J. HULL, E. WALLIN; alternates, R. FLINT, R. BERGHOLD, W. TUCKER.

Following the business meeting DR. F. A. LOWENHEIM of the Metal & Thermit Corporation, Rahway, N. J., was introduced by J. M. DUFORD. Dr. Lowenheim, speaking about "Recent Advancements in Tin Plating", outlined the advantages and disadvantages of alkaline tin plating, and briefly compared the acid and alkaline processes. Following a short history of tin plating, he showed slides of data on the potassium stannate process. It was a fine presentation of a pertinent and interesting subject.

GORDON W. MACDONALD, *Secretary*

### ROCHESTER BRANCH

On April 17, after VERN SCHAEFFER had outlined plans for the Fish Fry Supper on May 26, with bowling and cards, the Board of Managers presented its recommendations of officers for the coming year.

MR. FREDERICK JOHNSON, Hickok Manufacturing Company, Rochester, N. Y., presented a paper written by JAMES WEAVER, formerly of this Branch, dealing with improvements in the plating of jewelry at the Hickok plant. He brought much practical experience to the presentation of his subject.

GORDON W. MACDONALD, *Secretary*

### SAGINAW VALLEY BRANCH

The regular meeting on May 10 in the Zehnder Hotel, Frankenmuth, had an attendance of forty-nine guests and members.

The principal speaker was MR. JOHN G. DONSON, Manager of the Chemical Industrial Division of the Foxboro Company. Mr. Dobson's presentation of "Industrial Waste of the Plating Industry" included both large and small installations and should prove valuable in solving Michigan's number one problem of cyanide- and chromium-waste disposal.


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L. D. Faulman, Chairman of the Picnic Committee, discussed plans and set the date for July 15.

James Dunn won the door prize, a $10.00 hat presented by the Imperial Rack Company.

Wilmar W. Kaufmann,
*Recording Secretary*

## ST. JOSEPH VALLEY BRANCH

The regular meeting on April 12 was a joint meeting with Notre Dame Chapter of the American Society for Metals held at Notre Dame University. Forty A. E. S. members and guests attended the dinner, and approximately seventy-five A. E. S. members and guests came to the technical session. Including both Societies, approximately 150 were present at the technical session.

A caucus vote of the A. E. S. members elected four applicants to membership and the following as delegates to the A. E. S. Convention: John Lockerbie, Dr. Harold J. Wiesner, and Chester McDowell, with Ralph D. Wysong and Victor E. Peterson as alternates. Two applications for memberships were received.

Dr. E. A. Peretti, Chairman of the A. S. M., opened the technical session and welcomed the A. E. S. members. He then introduced Mr. Ralph D. Wysong, President of the St. Joseph Valley Branch of the A. E. S., who took charge of the session.

The speaker was Mr. Fred Keller, Chief, Metallography Division, Aluminum Company of America, and his subject, "Conditioning of Aluminum Alloys for Electroplating". The talk covered very thoroughly the zinc immersion process for plating aluminum alloys and the relative resistance to corrosion of plated aluminum alloys with various thicknesses of zinc underneath copper-nickel-chromium coatings. Precautions in the control of time cycles, temperature, and solution balance were discussed. Following the lecture Mr. Keller answered questions from the floor at some length. Despite the highly technical nature of his subject, Dr. Keller's presentation was such that the large proportion of practical platers in attendance were able to understand it; all were highly appreciative for the very simple explanation of a complex problem.

Eugene Roth, *Secretary-Treasurer*

## ST. JOSEPH VALLEY BRANCH

The meeting on May 3 was our annual Ladies' Night. Forty-one members and guests were present for the excellent dinner, and fifty-five attended the technical session. Dinner music and the Studebaker Four Barbershop Quartet provided the entertainment.

After two new members had been received, retiring President Ralph Wysong presented all of the newly elected officers to the assembly. The retiring officers were given a standing vote of thanks for their conduct of the Branch affairs.

Librarian Dr. Ernest Wilhelm then introduced our speaker for the evening. We were most fortunate to have Mr. Frank C. Mesle of Oneida, Ltd. present to the platers and their ladies his very interesting informal talk on "Silverware, Silverplating, and Silver Electroforming". Mr. Mesle explained in simple, nontechnical language the merits of plating, why parts are plated, and what to look for in quality of silver flatware and hollow ware. The progress of the silverplating industry over a period of some fifty years was illustrated by the increase in current density from 6–8 asf to some 200 asf. A bag full of samples and test specimens helped bring out his points. In conclusion, Mr. Mesle took us through the Oneida plant with a series of slides of the manufacturing steps necessary to produce flat and hollow silverware.

Eugene Roth, *Secretary-Treasurer*

## ST. LOUIS BRANCH

After the York Hotel had served dinner to thirty members and an additional twelve members had increased the attendance, President Conroy called the April 12 meeting to order. A. Barth, D. Bolyard, and Robert Bignall were appointed to serve as a Nominating Committee. The following members were elected Delegates to the Convention at Boston: Albert Barth, A. K. Robins, Edward Musick, and C. T. McGinley.

Two applicants were elected to active membership. One resignation was turned in.

Librarian Davies introduced Mr. J. B. Winters of R. O. Hull Company, Cleveland, Ohio, who spoke about "Hull Cell Control of Plating Baths".

Edward Hunleth, *Secretary*

## SAN FRANCISCO BRANCH

Mr. P. B. Carter of the Refinite Corporation gave an excellent talk about "Deionization of Water" at the meeting on April 20. Besides presenting a review of theory and a discussion of methods, equipment, and costs, he also dealt with water pollution and its relation to legislation. He recommended that electroplaters form an industry self-regulatory committee and that individual companies take steps to keep their cyanide and chromic acid waste concentrations down so as not to attract the attention of the new regional pollution boards.

A movie of the A. E. S. Los Angeles Branch A. C. S. Los Angeles Chapter telecast of electroplating was shown. A committee was formed, consisting of John Meehan, Raymond Karczynski, and Fred Huntington, which will investigate the possibility of a similar telecast in the San Francisco area.

At the suggestion by J. R. Pattenger, Chairman, the Membership Committee will have as members Clancy Owens, E. M. Kachman, Fred Huntington and B. F. Davis. Clancy Owens will poll the members about their desires as to meeting place, cost of dinners, and meeting topics.

Roy Fellom, Jr.,
*Secretary-Librarian*

## SOUTHEASTERN BRANCH

Twenty-four members were present at the regular meeting on March 31 in Robert Fulton Hotel, Atlanta, Ga. Following the Nominating Committee's report and one nomination from the floor, it was decided that each member in good standing be sent a ballot by mail, to be marked and returned not later than May 1.

Librarian Clyde Stovall introduced the speaker, Dr. A. Kenneth Graham, Executive Secretary of the Society, who gave a very informative, well illustrated talk about brass plating. A good discussion followed.

An invitation to a return visit was extended to Dr. Graham.

William T. Weymouth,
*Secretary-Treasurer*

Dr. Graham writes about his visit as follows:

There were twenty-four members present out of a branch membership of fifty-four, among them one each from Jacksonville, Fla., La Grange, Ga., Birmingham, Ala., Griffin, Ga., and Chattanooga, Tenn., and two from Spartansburg, S. C. The distance travelled by these members in order to attend a monthly meeting of the Branch should establish some kind of a record. The members attending from Spartansburg were obliged to take the midnight train home, which would bring them to Spartansburg after 5:00 A. M. President Stogner stated that the attendance was not unusual, even at meetings which recently had been scheduled in several of the distant places mentioned above.

My hat is off to the Branch which, as of April 1, was reported to be leading the third division of the membership contest and which is obliged to draw members from such great distances. The hospitality and good fellowship extended by the Branch is hereby gratefully acknowledged.

A. Kenneth Graham,
*Executive Secretary*

## SOUTHEASTERN BRANCH

Because of the amount of business which had to be taken care of at the meeting on May 12 in Atlanta, Ga., the meeting was called to order at 6 P. M. After the ballots had been counted, the following officers were installed:

*President*—E. J. Slemons, Spartanburg, S. C.

*First Vice-President*—D. J. Griffin, Birmingham, Ala.

*Second Vice-President*—George W. Taylor, Jacksonville, Fla.

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*Secretary-Treasurer*—WILLIAM T. WEYMOUTH, Atlanta, Ga.
*Librarian*—DR. FRED W. COX, Atlanta, Ga.
*Board of Managers*—R. E. NORMAN, Birmingham, Ala; H. R. STOGNER, Atlanta, Ga., C. H. HOHNER, Atlanta, Ga.

It being customary for the Branch to send one delegate to the Convention with an expense allowance, our good friend DR. FRED W. COX was elected our choice. The following members were appointed Delegates: DUDLEY SMITH, Spartanburg, S. C.; CARL CARTLEDGE, Atlanta, Ga. Alternates: E. J. SLEMONS, Spartanburg, S. C.; H. R. STOGNER, Atlanta, Ga., and GEORGE W. TAYLOR, Jacksonville, Fla.

The President was instructed to appoint a publicity chairman for the purpose of obtaining needed publicity from local newspapers.

Following a good steak dinner, at which twenty-four members and guests were present, Dr. Cox introduced DR. R. V. VAN DENBERG of the Aluminum Company of America, who presented a very interesting illustrated lecture on the plating of aluminum alloys. The audience's attention was complete throughout the program, and considerable discussion followed.

WM. T. WEYMOUTH,
*Secretary-Treasurer*

## SYDNEY BRANCH

The 62nd regular meeting on April 13 in the Trust Building, Sydney, after general business had been concluded, took the form of a "Question Box". Everybody present left the meeting with much more knowledge of plating than they had when they came. This form of meeting should perhaps be held more often.

H. COATES, *Secretary*

## SYRACUSE BRANCH

On April 17, the entertainment committee presented the color film, "The Wine Industry", followed by sample drinks and bottles of wine, courtesy of the Onondaga Winery Corporation of Syracuse and Gallo Wines.

The speaker was MR. R. L. DEUBNER of the Battelle Development Corporation, who gave an interesting talk about "Battelle Metal Finishing Processes". A lively discussion period followed.

The Chairman of the Election Committee announced that the following had been elected for 1950–1951:

*President*—TED DUVAL
*First Vice-President*—HANK HOLBERT
*Second Vice-President*—KEN PARNELL
*Secretary*—L. WOOD
*Treasurer*—W. PIASECKI
*Board of Managers*—H. GERHARDT, N MAFFEI, E. HOLLISTER

Attendance was thirty-eight.

K. S. PARNELL,
*Secretary-Treasurer*


FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 592.

# Membership Report of the A. E. S.

### Elections

**ADELAIDE BRANCH:** *R. W. Barker, *K. J. Franks, *H. B. Vawser

**ALLENTOWN-READING BRANCH:** *Herman P. Langrock, Wilson A. Laucks, Louis C. Peterson, Anthony Sciarra

**BOSTON BRANCH:** J. Alcide Beaumier, George E. Flint, Jr., Miles G. Mutchler, Richard L. Peck, Joseph R. Powell, Louis J. Reczek, Paul E. Wood

**BRIDGEPORT BRANCH:** Harold A. Lundquist, John C. Manganello, George S. McCormick, Gerald B. Rice

**CHICAGO BRANCH:** Donald M. Berlin, J. E. Cummings, R. R. Kamerschen, Joseph A. Kryszak, Thomas F. O'Brien, T. A. Sailor, Fred H. Stoeke, E. J. Witkowski

**CINCINNATI BRANCH:** Lester A. Helmich, Aaron Leigh, Carl H. Truman

**CLEVELAND BRANCH:** Edward Bolon, Stanley I. Busch, J. H. Carlton, Frank J Cisco, Jasper Coffaro, Alexander Dunetz, John Fedor, Thomas W. Gulley, Jr., Thomas Hadden, Wilbert M. Radtke, R. E. Sagendorf, George A. Shepard, George R. Shope, Richard E. Shope, Thomas R. Thomas, John J. Vanas

**COLUMBUS BRANCH:** Burt Friedl, Hugh D. McManus, Jack Withrow

**DETROIT BRANCH:** W. A. Bayer, J. Boyd, B. B. Davis, H. De Loy, J. V. Downer, A. M. Everit, E. Finnie, H. Greedland, N. T. Golen, S. C. Hale, D. K. Henry, U. C. Jones, W. K. Lomason, P. W. Moehle, R. C. Racine, G. O. Rice, D. L. Rockwell, C. L. Ryan, M. Sclar, N. B. Smith, R. W. Springer, R. E. Vanni, J. H. Withers

**GRAND RAPIDS BRANCH:** *Phyllis E. Fowle, *Leonard Grove, *Arnold P. Parker, *Don J. Wiggers, *H. Bussing, *Stanley Van Koevering, *Bernard R. Julien, *Carl E. Green, *P. W. Goodspeed, *Frank Badaluco, *Lee F. Phillips, *John Wickering, *James A. Sweetland, *Max Swan, *Harry Dickson, *John C. Miller, Wallace K. Aiken, Forrest C. Bissell, Robert O. Blackford, Otto J. Klingenmaier, Warren B. Rice, Paul H. Roberts

**HARTFORD BRANCH:** Louis F. Galasso, Anthony Gentile, Frank Sheltz

**INDIANAPOLIS BRANCH:** Edna Rohrabaugh, Jacob Skogland

**LOS ANGELES BRANCH:** John Hammer, Marvin Noblett, Francis Odell, Charles H. Stamey, E. L. York

**MELBOURNE BRANCH:** K. W. C. Howard, J. H. W. Hunt

## Membership Competition

| | Membership April 1, 1949* | New Members | Net Change in Membership | Per cent Net Change |
|---|---|---|---|---|
| **FIRST GROUP** | | | | |
| GRAND RAPIDS | 141 | 6 | +17½ | +12.4 |
| CLEVELAND | 195 | 16 | +13½ | + 6.9 |
| BOSTON | 142 | 7 | + 9 | + 6.3 |
| **DETROIT**† | 483 | 23 | +23 | + 4.8 |
| LOS ANGELES | 201 | 5 | + 5 | + 2.5 |
| TORONTO | 124 | .. | + 3 | + 2.4 |
| CHICAGO | 372 | 8 | + 9 | + 2.4 |
| HARTFORD | 132 | 3 | + 2½ | + 1.9 |
| NEW YORK | 280 | 3 | + 4 | + 1.4 |
| PITTSBURGH | 142 | 1 | + 1 | + 0.7 |
| BRIDGEPORT | 155 | 4 | + ½ | + 0.3 |
| WATERBURY | 125 | .. | ..... | ..... |
| MILWAUKEE | 124 | .. | − 1 | − 0.8 |
| PHILADELPHIA | 192 | 3 | − 3 | − 1.6 |
| NEWARK | 238 | .. | − 4 | − 1.7 |
| **SECOND GROUP** | | | | |
| MONTREAL | 68 | 5 | + 4 | + 5.9 |
| CINCINNATI | 87 | 3 | + 5 | + 5.7 |
| ROCHESTER | 104 | 4 | + 4 | + 3.8 |
| INDIANAPOLIS | 94 | 2 | + 2 | + 2.1 |
| **MELBOURNE**† | 111 | 2 | + 1½ | + 1.3 |
| SYDNEY | 109 | 2 | + 1 | + 0.9 |
| TWIN CITY | 71 | .. | ..... | ..... |
| ADELAIDE | 72 | .. | ..... | ..... |
| BUFFALO | 77 | .. | ..... | ..... |
| BALTIMORE-WASH. | 85 | .. | ..... | ..... |
| ST. LOUIS | 97 | 2 | ..... | ..... |
| NEW HAVEN | 106 | .. | − ½ | − 0.5 |
| DAYTON | 93 | .. | − 3½ | − 3.8 |
| PROV.-ATTLEBORO | 112 | 2 | − 9 | − 8.0 |
| SYRACUSE | 85 | 2 | −12 | −14.1 |
| **THIRD GROUP** | | | | |
| COLUMBUS | 47 | 3 | + 4½ | + 9.6 |
| ST. JOSEPH VALLEY | 66 | 6 | + 6 | + 9.1 |
| ALLENTOWN-READING | 37 | 3 | + 3 | + 8.1 |
| SPRINGFIELD | 51 | 1 | + 1 | + 2.0 |
| HAMILTON | 23 | .. | ..... | ..... |
| WESTERN ONTARIO | 23 | .. | ..... | ..... |
| TOLEDO | 49 | .. | ..... | ..... |
| ROCKFORD | 64 | .. | ..... | ..... |
| SAN FRANCISCO | 66 | .. | ..... | ..... |
| LANCASTER | 62 | .. | − ½ | − 0.8 |
| JACKSON-LANSING | 57 | .. | − 1 | − 1.8 |
| SAGINAW VALLEY | 64 | .. | − 2 | − 3.1 |
| LOUISVILLE | 25 | .. | − 1 | − 4.0 |
| **SOUTHEASTERN**† | 54 | .. | − 4 | − 7.4 |
| **OUTSIDE COMPETITION** | | | | |
| AT LARGE | 104 | 12 | +11 | ..... |
| IN TRANSFER | 27 | .. | − 4 | ..... |
| **TOTAL A. E. S.** | 5,236 | 131 | +91 | + 1.7 |

Active Membership, June 1, 1950 ..... 5,327

*Subject to Correction. †Winners of membership competition in 1948-1949.

**MILWAUKEE BRANCH:** William J. Cotton, Richard R. McGuire, D. R. Mittelstaedt

**MONTREAL BRANCH:** Mendel C. Cohen, Bert T. Kelly, Aurele Lauzon, J. Laviolette, John J. Moreau

**NEW YORK BRANCH:** Arthur E. Jacobs, Daniel Marmer, Arthur Wasserman

**PHILADELPHIA BRANCH:** Hugh Gehman, Truman C. Oberndorf, Charles J. Wilmore

**PITTSBURGH BRANCH:** Elliott R. Coyle

**PROVIDENCE-ATTLEBORO BRANCH:** *Harry D. Goodinson, *Fred W. Kolling, Jr., Robert F. Cummings, James R. Pacheco

**ROCHESTER BRANCH:** Thomas J. Baker, John T. Brennan, C. E. Burt, Joseph M. Diesinger

**ST. JOSEPH VALLEY BRANCH:** Hugh F. Huppert, Ray J. Kaehr, William E. Sapp, Clay A. Sayers, Harold Sherk, Carl A. Swanson

**ST. LOUIS BRANCH:** Albert B. Chance, John Marshall

**SPRINGFIELD BRANCH:** E. F. Koetsch, Jr.

**SYDNEY BRANCH:** Alfred Turrin, George G. Wheen

**SYRACUSE BRANCH:** A. David Douglas, Philip N. Jacques

**MEMBERSHIP-AT-LARGE:** Robert M. DeTray, J. T. Dinkeloo, P. H. Douwenga, Nickola J. Fuchs, Samuel E. Haggard, M. F. Hiles, A. Larson, Arthur B. Novick, Earl S. Patton, William W. Sellars, E. L. Whitmore, Jr., Glen V. Wilson

### Reinstatements

**ADELAIDE BRANCH:** *F. G. Fuss

**BOSTON BRANCH:** Oscar F. Pearson

**CHICAGO BRANCH:** R. A. Ruenzel, Edward Beevar, E. I. Ingram, P. E. Pelletier

**CINCINNATI BRANCH:** J. Robert Adams, Robert J. Knoepfler, Larry Rassmussen, August Schwering

**COLUMBUS BRANCH:** Robert Keene

**GRAND RAPIDS BRANCH:** *Donald Martin, *Donald L. Miles, Ernest J. Banner, Max Beam, William E. Daugherty, Robert B. Hames, Richard G. Heeringa, Richard D. Link, Leon C. Myers, Clyde Nuttall, T. E. O'Callaghan, Louis A. Poyer, Samuel G. Yared, Glen Butler, John Cole

**NEW YORK BRANCH:** Vincent L. Wiker

**ROCHESTER BRANCH:** Frank H. Cornwall, Nickolas Ribaudo, E. Reip

**TORONTO BRANCH:** H. Brock, L. Gooden, E. C. Hiller

### Transfers

*Raymond E. Housel to Allentown-Reading Branch;*Fred G. Brune from Cincinnati Branch; *Richard Jager from Grand Rapids Branch; *C. W. Gilbert from Sydney Branch; I. A. Lee to Boston Branch; W. G. Cryderman from Dayton Branch to Cleveland Branch; John B. Hitchcock to Detroit Branch; Harold W. Faint from Grand Rapids Branch; C. W. Gilbert to Melbourne Branch; K. J. Ackerman from Membership-at-Large; C. Fred Gurnham from New Haven Branch to Boston Branch; Henry Haas to Bridgeport Branch; Richard Jager to Columbus Branch; Arthur O. Nieman from Detroit Branch; George E. Vibberts, Jr. to Hartford Branch; Chester W. Smith from Lancaster Branch; Frank J. Kozma to Rochester Branch; W. H. Moffatt to Rochester Branch.

### Resignations

**BRIDGEPORT BRANCH:** Elton V. Buckley, Nicholas Genovese, Thomas H. Wilber

**CHICAGO BRANCH:** Bruno Nimick, Clarence Ziehl

**CINCINNATI BRANCH:** *Gar P. Freyer, Edward F. Ratterman

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DETROIT BRANCH, A. E. S. Annual Stag Day at Forest Lake Country Club near Pontiac, Mich., on July 29.

FIRST U. S. INTERNATIONAL TRADE FAIR in International Amphitheatre, Coliseum, Navy Pier, and Chicago Arena, Chicago, Ill., on August 7–20.

INDUSTRIAL FINISHES EXHIBITION at Earle Court, Kensington, London, England on August 30-September 7.

FIFTH NATIONAL INSTRUMENT CONFERENCE AND EXHIBIT in Memorial Auditorium, Buffalo, N. Y., on September 18–22.

THE ELECTROCHEMICAL SOCIETY. 98th Meeting in Buffalo, N. Y., on October 11–14.

THIRTY-EIGHTH NATIONAL SAFETY CONGRESS AND EXPOSITION OF THE NATIONAL SAFETY COUNCIL, Chicago, Ill., on October 16–20.

NATIONAL METAL CONGRESS AND EXPOSITION, American Society for Metals, in International Amphitheatre, Chicago, Ill., on October 23–27.


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Boston, June 16, 1950

Dear Reader:

Another successful A.E.S. Convention ended early this morning when Jack Kaiser's Orchestra laid down its instruments and the dancers slowly left the Imperial Ball Room of the Hotel Statler.

Two impressions stand out. The first is that the labors of many laboratory workers during the last several years to produce better deposits at lower costs are beginning to bear fruit in the plants. Nearly all the papers presented at the technical sessions bear out this impression. The symposium on "Smoothing and Leveling of Electrodeposits", organized by Myron B. Diggin, is likely to be counted among the milestones in electroplating progress.

The second impression is that Boston lived up to its advance publicity as offering hospitality of a unique kind. To many the Boston Pops concert on Tuesday night was a revealing experience; few had realized that good music can be coupled with good food and drink for double enjoyment. None who went on the outing on Wednesday afternoon will forget the clambake under the big circus tent, with three huge mounds of clams and lobsters on steaming seaweed. The banquet dinner with its beautiful rare roast beef is another pleasant memory. And who has ever before heard such eloquence as that of General Chairman Manson Glover in his welcoming speech or that of Daniel Gray in his opening address on "Electroethical Aspects of Photogenic Hydrolysis". Add the entertainment provided by the International Fellowship Club at its Open House on Monday evening and the ladies' program, and you have a heady brew not soon to be forgotten.

The final registration figure was 1185, of which over 25 per cent were for the ladies. A report of the ladies' activities will appear in an early issue.

A few of the actions taken at the final business session of the Society may be mentioned here. The present officers were elvated in rank: William Neill to President, C. F. Nixon to First Vice-President, and F. J. MacStoker to Second Vice-President. The new Third Vice-President is Dr. G. P. Swift of the Boston Branch, Convention Co-Chairman. A. W. Logozzo remains on the Board as Past President.

Three new Honorary Members were elected: Clarence Van Derau of Dayton Branch and John E. Stirling of New York Branch, both of whom are Past Presidents of the Society, and Frank Clark of Springfield Branch, who in the past assisted in the formation of many Branches. Awards of Merit were given to William M. Tucker, B. C. Case, and W. M. Phillips for their services to the Society.

Four paper awards were presented: A.E.S. Gold Medal to E. J. Roehl and Dr. W. A. Wesley; A.E.S. Silver Medal to Dr. A. Brenner, D. E. Couch and E. K. Williams; Certificate of Honorable Mention to Dr. A. K. Graham; and A.E.S. Chromium Plating Award, sponsored by Nutmeg Chromium Corporation, to J. B. Winters and R. O. Hull. Branch Exhibit Awards went to the Chicago, Hartford, and Newark Branches, with Honorable Mention to the Detroit Branch. Individual Exhibit Awards were earned by A. G. Bartman and Klem Petrosius, Chicago; Vernon Julianne, Forest Hills, N. Y., and William B. Harvey, Quincy, Mass., with Honorable Mention to J. Andrus and students of Immaculata High School, Chicago.

Not less than three branches, Philadelphia, New York and Buffalo, bid for the 1953 Convention; Philadelphia was the winner with an overwhelming majority.

And so one's eyes turn from the East to the far West—to Los Angeles, which will be the 1951 Convention City.

Sincerely,

Gustaf Soderberg

Editor

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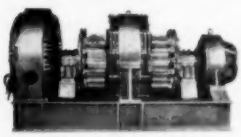

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